ABSTRACTS OF NORTH AMERICAN GEOLOGY

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INTRODUCTION

Abstracts of North American Geology contains abstracts of technical papers and books and also citations of maps on the geology of North America including Greenland, the West Indies, as well as the State of Hawaii, Guam, and other island possessions of the United States. Articles of a general nature by North American authors are cited even though published in foreign journals, but those by foreign authors are included only if they appear in North American journals. Abstracts are prepared only of material that is believed to be generally available. Ordinarily abstracts are not published of material with small circulation (such as dissertations, open-file reports or memorandums) or of other papers presented orally at meetings.

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The abstracts in this issue were prepared by Paul Averitt, Calvin S. Bromfield, Arthur P. Butler, Jr., Georgianna D. Conant, Howard R. Cramer, W. C. Culbertson, Jacquelyn H. Freeberg, John W. Hosterman, Ralph W. Imlay, Virginia M. Jussen, Elizabeth S. Loud, Mildred C. Mead, Virginia S. Neuschel, Anne C. Sangree, Katherine A. Sommer, and Dorothy B. Vitaliano.

ABSTRACTS

00978 **Abbey, Sydney.** Analysis of rocks and minerals by atomic absorption spectroscopy—Pt. 2, Determination of total iron, magnesium, calcium, sodium and potassium: Canada Geol. Survey Paper 68-20, 21 p., tables, 1968.

A general method, developed earlier for the determination of magnesium and iron in rocks and minerals is modified and extended to the determination of calcium, sodium and potassium, in most cases on the same solution. Possible adaptation of the method to a new precise scheme of analysis is discussed and possible future work indicated.—Author's abstract

06907 **Adam, David P.** Late-Pleistocene and recent palynology in the central Sierra Nevada, California, *in* Quaternary paleoecology—Internat. Assoc. Quaternary Research, 7th Cong., 1965, Proc., V. 7: New Haven, Conn., Yale Univ. Press, p. 275-301, illus., tables, 1967.

Pollen analyses of two surface transects across the Sierra Nevada and four stratigraphic sections from the Lake Tahoe and Yosemite areas have yielded a preliminary climatic history for the central Sierra Nevada for the time since the recession of the last Wisconsin (Tioga) glaciers. The transition from a glacial to a modern vegetation occurred about 10,000 radiocarbon years ago, followed by a postglacial climatic optimum in the Sierra, during which two warm periods occurred. The climatic optimum terminated about 2,900 radiocarbon years ago with the beginning of the Little Ice Age.—Author's abstract

01013 **Adams, John Emery.** Permian salt deposits, west Texas and eastern New Mexico [abs.], *in* Saline deposits—Internat. Conf. Saline Deposits, Houston, Tex., 1962, Symposium: Geol. Soc. America Spec. Paper 88, p. 407, 1968.

00786 **Adams, John W.** Rhabdophane from a rare-earth occurrence, Valley County, Idaho, *in* Geological Survey research 1968, Chap. B: U.S. Geol. Survey Prof. Paper 600-B, p. B48-B51, illus., tables, 1968.

Rhabdophane, a hydrated phosphate of the cerium-group rare-earth elements, occurs in a highly oxidized fault or shear zone near Monumental Summit in Valley County, Idaho. The rhabdophane, which is associated chiefly with hydrated iron oxides, clays, and quartz fragments, is probably of supergene origin. Preliminary analysis shows it to be deficient in cerium like the rhabdophane from Salisbury, Conn. Optical data, X-ray data, and analyses of 10 samples from the rare-earth-bearing zone are given.—Author's abstract

00925 **Adams, R. D.; Thom, B. G.** Relationship between coastal landforms and size distribution of surficial sediments, Horry and Marion Counties, South Carolina: Southeastern Geology, v. 9, no. 1, p. 39-56, illus., tables, 1968.

The size distributions of sediments from coastal landforms were studied by stratified random sampling and hierarchical analysis of variance. A geomorphic study established the basis for the sampling plan and a frame of reference for evaluating the statistical analysis. Barrier sediments differ in age and traverse categories; tidally influenced backbarrier flat sediments are not significantly different in either category. There is little variation in size distributions from various environments within the Recent barrier. Samples from environments within the Recent backbarrier flats

showed great variation in size properties. This is a reflection of the environmental diversity and added to the problem of sampling the older backbarrier flats. Areal variation in size distribution properties as approached by stratified random sampling and ANOV does not distinguish other possible sources of variation such as weathering.—*from* Authors' abstract

01094 **Ahmad, N.; Jones, R. L.; Beavers, A. H.** Genesis, mineralogy, and related properties of West Indian soils—[Pt.] 1, Montserrat series, derived from glauconitic sandstone, central Trinidad: Jour. Soil Sci., v. 19, no. 1, p. 1–8, illus., tables, 1968.

In the Montserrat series substantial amounts of exchangeable K, available P, and favourable organic matter content and distribution contribute to its unique properties. P occurs in amounts ranging from 0.4 to 0.6 percent, about 75 percent of which is inorganic with Fe phosphates making up the bulk. Exchangeable K is derived from glauconite. High exchangeable Ca and Mg contents from weathering of carbonates impart a favourable pH to the soil. Structural stability to 120 cm depth is associated with high free iron oxide, organic matter, and Ca contents. The outstanding feature in mineral weathering is the rapid transformation of glauconite through vermiculite to kaolinite and the formation of goethite. Much of this weathering occurs in the calcareous, oxidized, friable parent rock. The features described above substantiate classification as a Brown Earth (Mollisol).—*from* Authors' summary

01095 **Ahmad, N.; Jones, R. L.; Beavers, A. H.** Genesis, mineralogy, and related properties of West Indian soils—[Pt.] 2, Maracas series, formed from micaceous schist and phyllite, Northern Range, Trinidad: Jour. Soil Sci., v. 19, no. 1, p. 9–19, illus., tables, 1968.

Soils of the Maracas series from two sites in the Northern Range of Trinidad differ only in minor aspects. With the exception of cheluviation of iron and formation of goethite the soils preserve the mineralogy and to some extent the structure of the parent phyllite. Weathering of calcic and sodic plagioclases is rapid. Mica is well preserved even in surface horizons and resists physical weathering, but when reduced to clay-size, it weathers rapidly to kaolinite throughout the solum with little accumulation of expandable minerals. Exchangeable K is low. Low levels of availability of Ca, Mg, and particularly P are also characteristic. Total inorganic P is very low. Organic P, from the carbonaceous matter of the parent rock, increases with depth. From the results obtained, the Maracas series may be classified as a latosol.—*from* Authors' summary

00840 **Albers, John P.; Kleinhampl, Frank J.** Spatial relation of mineral deposits to Tertiary volcanic centers in Nevada [abs.]: Econ. Geology, v. 63, no. 1, p. 89–90, 1968.

06799 **Alberstadt, Leonard Philip.** Brachiopod biostratigraphy of the Viola and "Fernvale" Formations (Ordovician), Arbuckle Mountains, south-central Oklahoma [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 6, p. 2475B, 1967.

Alderman, G. R. *See* Gorrell, H. A. 01028

Alexander, G. S. *See* Pemberton, H. Earl. 00802

Alexander, W. H., Jr. *See* Anders, R. B. 00815

06772 **Aley, Thomas.** Hydrology of a karst watershed in the Missouri Ozarks [abs.]: Caves and Karst, v. 9, no. 6, p. 51, 1967.

Alfors, John T. *See* Putnam, George W. 00816

06853 **Allard, Gilles-O.** Geology of northwest quarter of Rinfret township, Abitibi-East and Roberval counties [also French edition]: Quebec Dept. Nat. Resources Prelim. Rept. 567, 16 p., tables, geol. map, 1967.

Underlying rocks in this area east of Chibougamau Lake are Precambrian. The Doré Lake mafic complex and Chibougamau Lake granitic complex belong to the

Superior province. Rocks of the Grenville province, in the southeast, are poorly exposed and consist of hornblende gneisses invaded by hornblende quartz diorites and pegmatites. Faults mark the boundary between the provinces. Mineral exploration in the area includes studies of magnetite-bearing gabbro in the southwest corner, and electrical surveys in the northwest. The magnetite-bearing band in the gabbro contains layers of titaniferous magnetite for which assays are given; it also contains vanadium and resembles the Bushveld deposit. Other areas recommended for exploration are the shear zone between provinces for sulfides or gold, and the pyroxenite layer in the gabbro for platinum.—ESL

Allen, Thomas E. *See* Pickering, Sam M., Jr. 00889

00846 **Allison, Edwin Chester.** The Bivalvia of the Alsitos Formation, northwestern Baja California, México [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 7, p. 2898B, 1968.

00815 **Anders, R. B.; McAdoo, G. D.; Alexander, W. H., Jr.** Ground-water resources of Liberty County, Texas: Texas Water Devel. Board Rept. 72, 140 p., illus., tables, 1968.

Aquifers in Liberty County contain large quantities of fresh water that extends to depths as great as 1,800 feet below sea level. Development of ground-water resources resulted primarily from increased use for rice irrigation. Ground-water use can be increased to about 200 mgd if most development is restricted to the northern and central parts. Aquifers, primarily sand, silt, and clay with smaller amounts of gravel and calcareous material, crop out in belts nearly parallel to the Gulf of Mexico shoreline and dip gently toward the Gulf. The four units are: the Jasper aquifer, Burkeville aquiclude, and the Evangeline and Chicot aquifers. The Evangeline and Chicot supply most of the ground water used in the county and have the greatest potential for future development.—*from* Authors' abstract

06884 **Anderson, R. Y.** Sedimentary laminations in time-series study, *in* Computer applications in the earth sciences—Colloquium on time-series analysis: Kansas Geol. Survey Computer Contr. 18, p. 68-72, illus., 1967.

Simple repetitions of components represent shortest term aspects of sedimentary processes. In quiet saline or unoxygenated basins where destructive organisms are excluded, varves of particle rain tend to be well preserved. Two basic time-related concepts, first applied to ecologic changes in 1939, are: aspection, or seasonal changes, and annuation, or annual frequency of production of components. Generally with different types, their calibration in time-series analysis and study of component associations lead to more detailed petrographic correlation. By lateral persistence, evaporitic, organic, and some pelagic clay laminations lend themselves to stratigraphic correlation. Examples are: the Castile Anhydrite, Permian carbonate-sulfate series in Texas and New Mexico; and Rita Blanca lake deposits, and Pleistocene clay and carbonate varves in Texas.—GDC

01133 **Andrews, J. T.** Notes on glacio-isostatic rebound studies, Baffin Island, Northwest Territories, Canada: Coastal Research Notes, v. 2, no. 7, p. 11-14, 1968.

Evidences of present submergence of north and east coasts of Baffin Island have been noted, in active cliff-cutting and prograding shingle ridges; the low-energy west coast has extensive flats. A SW uptilt agrees with other evidence of unequal ice-loading. Recent studies indicate that use of three methods of determining tilt direction (Anderson, 1967) depends largely on geometry of the area investigated. From 10 recent uplift curves of Baffin Island and data from 67 sites in Arctic Canada, where uplift and date of deglaciation were known, a graph expresses the effect of different rates of retreat on the amount of postglacial rebound. Analysis of 21 postglacial uplift curves shows similar proportional response. The lower strandlines are related more to fluctuations in sediment supply than to balance between isostatic and eustatic rates of rise.—GDC

00871 **Andrews, James Einar.** The Bahama Canyon system [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 7, p. 2924B, 1968.

Anstey, Robert L. *See* Brown, George D. 00929

Armbrustmacher, Theodore J. *See* Wrucke, Chester T. 00838

01076 **Armstrong, Richard Lee.** Sevier orogenic belt in Nevada and Utah: Geol. Soc. America Bull., v. 79, no. 4, p. 429–458, illus., table, 1968.

Sedimentation in the Cordilleran miogeosyncline in Nevada and Utah continued from before the appearance of Cambrian fossils until it was interrupted and shifted eastward into the area of the Colorado Plateau by an orogeny in the western part of the miogeosyncline during Jurassic time. During Cretaceous time the Sevier orogenic belt developed at the eastern edge of the Cordilleran miogeosyncline and was a major source of sediments in the Rocky Mountain miogeosyncline farther east. Decollement thrusts and a few large folds are characteristic of the Sevier orogenic belt, which was broken up principally by north-trending post-Oligocene normal faults. Widespread Tertiary deposits, notably Oligocene ignimbrites, permit paleogeologic reconstruction of the belt.—WHN

01102 **Armstrong, Richard Lee.** A model for the evolution of strontium and lead isotopes in a dynamic earth: Rev. Geophysics, v. 6, no. 2, p. 175–199, illus., tables, 1968.

Contrasting interpretations of existing models of Sr and Pb isotope evolution can be eliminated with one in which crustal material is recycled through the mantle, the crust and upper mantle being in a steady-state system. Sialic material is eroded into ocean basins, isotopically homogenized, dragged into the mantle in marginal orogenic belts and island arcs, then, after isotopic equilibration, returned to the continents as volcanics. This explains Pb evidence of widespread ancient continents and Sr evidence of continual addition to continents. Sr-isotope evolution is dominated by the Sr reservoir in the mantle, and Pb by isotopic mixing during erosion and sedimentation. Differences in evolution are due to differing responses to parts of the steady-state cycle because of differences in parent-daughter ratios in sialic crust as compared with upper mantle, and in degree of enrichment of parent and daughter products in the crust.—ESL

00791 **Arnow, Ted; Mattick, R. E.** Thickness of valley fill in the Jordan Valley east of the Great Salt Lake, Utah, *in* Geological Survey research 1968, Chap. B: U.S. Geol. Survey Prof. Paper 600-B, p. B79–B82, illus., 1968.

A seismic-refraction profile in the Jordan Valley, east of the Great Salt Lake, Utah, showed three velocity layers. The upper two are correlated with valley fill of Quaternary and Tertiary age, whereas the lowest is correlated with consolidated rock. The computed thickness of the fill along the seismic profile ranges from about 600 to 4,800 feet.—Authors' abstract

01036 **Atwater, Gordon I.** Gulf Coast salt dome field area, *in* Saline deposits—Internat. Conf. Saline Deposits, Houston, Tex., 1962, Symposium: Geol. Soc. America Spec. Paper 88, p. 29–40, illus., 1968.

A cursory description of the structure and stratigraphy of the region is given in preparation for a field trip. Special emphasis is placed upon the Grand Saline, Palestine and Winnfield salt domes in eastern Texas and northern Louisiana, and the Jefferson and Weeks Island salt domes in southern Louisiana. No new information is included.—HRC

00985 **Aumento, F.; Lawrence, D. E.** Photographic control of deep-sea dredging: Canada Geol. Survey Paper 68-9, 13 p., illus., 1968.

From an examination of the motions of a dredge on the sea floor, the authors propose improvements to existing deep-sea dredging techniques. A special dredge, fitted with photographic equipment, was built and this dredge and the observations it made possible are described in detail.—Authors' abstract

00932 **Averitt, Paul.** Stripping coal resources of the United States: U.S. Geol. Survey Bull. 1252-C, p. C1–C20, tables, 1968.

The amount of coal mined and potentially minable by strip-mining methods has increased steadily throughout the years, concomitantly with an impressive increase in the size and efficiency of strip-mining machinery. An analysis by States of the geologic and technologic sources of information on stripping coal indicates that as of January 1, 1967, the remaining recoverable stripping-coal resources in the United States in the 0- to 100-ft-thick overburden range totaled about 108 billion tons. This figure is 28 times the cumulative strip-coal production from the beginning of mining to January 1, 1967, and it is 600 times the 1966 strip-coal production of 179 million tons. These convenient comparisons are an aid in appreciating the magnitude of the stripping-coal resources, but they do not represent life expectancy because the rate of production and the estimated size of stripping-coal resources will surely change in the future.—PA

00810 **Avery, T. Eugene.** Interpretation of aerial photographs (2d edition): Minneapolis, Minn., Burgess Publishing Co., 324 p., illus., tables, 1968; originally published 1962.

The material included in the 13 chapters of the first edition are covered in only nine in the second. Of the last seven chapters, six contain information that was not generally treated in the 1962 edition: remote-sensing techniques, agricultural and land-use patterns, landforms and physiographic features, engineering applications, urban-industrial patterns, and air intelligence and military target analysis. A glossary of photogrammetric terms is included. The list of references, expanded from 70 to 249, are classed according to subject and put at the end of each chapter. The first eight chapters deal with basic techniques; 12 exercises for self-instruction have been incorporated.—ESL

01075 **Baars, D. L.; See, Paul D.** Pre-Pennsylvanian stratigraphy and paleotectonics of the San Juan Mountains, southwestern Colorado: Geol. Soc. America Bull., v. 79, no. 3, p. 333-349, illus., 1968.

A graben-faulted anticline near Silverton, Colo., formed before Late Cambrian, was active into Early Permian. In Late Cambrian, upper Precambrian quartzite was downfaulted next to older metamorphic rocks; the quartzite then supplied talus to Upper Cambrian deposits that flanked the graben. In Late Devonian, marine sandstone was deposited along the flanks of the structure, but the first unit deposited across the faulted fold was still younger Devonian dolomite. Highest Devonian or lowest Mississippian limestone is locally present within the downfaulted block. Lower Mississippian dolomite thins abruptly onto the flanks of the structure; within the graben it is thin or forms erosional remnants in overlying strata, suggesting post-Early Mississippian erosion. Displacement of Pennsylvanian and Lower Permian strata along flanking faults demonstrates that graben-faulting continued into Early Permian time.—HCB

Baerreis, David A. *See* Bender, Margaret M. 01122

00896 **Bailey, Arthur C., Jr.; Radcliffe, Dennis.** Geology of the Oxford beryl pegmatite mine, Troup County, Georgia [abs.]: Georgia Acad. Sci. Bull., v. 26, no. 2, p. 70, 1968.

06779 **Bailey, S. W.** Crystal structure of layer silicates, Pt. 1, *in* Layer silicates—A.G.I. short course lecture notes, New Orleans, La., Nov. 17-19, 1967: Washington, D.C., Am. Geol. Inst., p. SB1B-SB21B, illus., tables, 1967.

Considerable discussion is given to octahedral sheet configuration, especially dioctahedral sheets and trioctahedral sheets. Tables show the mineral data. The articulation of octahedral and tetrahedral sheets is discussed also, with emphasis upon intrinsic misfits, tetrahedral rotation, the direction of rotation, and other structural adjustments.—HRC

06780 **Bailey, S. W.** Crystal structures of layer silicates, Pt. 2, *in* Layer silicates—A.G.I. short course lecture notes, New Orleans, La., Nov. 17-19, 1967: Washington, D.C., Am. Geol. Inst., p. SB1C-SB17C, illus., tables, 1967.

The most recent advances in octahedral and tetrahedral cation ordering and polytype stabilities are discussed. Examples are cited in tabular form.—HRC

06836 **Bailey, S. W.** Polytypism of layer silicates, *in* Layer silicates—A.G.I. short course lecture notes, New Orleans, La., Nov. 17–19, 1967: Washington, D.C., Am. Geol. Inst., p. SB1A–SB28A, illus., tables, 1967.

A brief discussion of the origin of polytypism is followed by ground rules. Polytypes of 10A micas, 7A serpentines, and 14A chlorites are derived systematically, with the basic assumptions being used defined. Six simple polytypes of mica are derived, and five naturally occurring examples are described. Other types described are twelve simple polytypes of serpentine, of which eight are known to occur naturally and four simple polytypes of chlorite, of which three are known in nature.—HRC

00919 **Baldy, Mark B.** Molluscan faunas of the lower Flagstaff Formation, Fairview Canyon, Sanpete County, Utah: Sterkiana, no. 29, p. 1–8, illus., 1968.

A section 108 feet thick was sampled, with special attention to the shale and mudstone units. Variations and randomness were also tested by collecting horizontally. Eight species of gastropods are discussed from this Paleocene formation; three are pulmonates. Statistical evaluation indicates that food supply was not a factor for the variation. The dark color of the sediments suggests that the vegetation in the lake must have been plentiful.—HRC

00930 **Ballard, J. Alan; Sorensen, F. H.** Preglacial structure of Georges Basin and Northeast Channel, Gulf of Maine: Am. Assoc. Petroleum Geologists Bull., v. 52, no. 3, p. 494–500, illus., 1968.

Data from continuous seismic-reflection profiles across the Gulf of Maine indicate that Georges Basin and Northeast Channel (1) predate glaciation, (2) were formed by fluvial erosion, and (3) were sites of a well-developed pre-Tertiary drainage system, as shown by the presence of eroded Cretaceous sediments unconformably beneath relatively undeformed Tertiary deposits.—WCC

Banner, F. T. *See* Eames, F. E. 01042

00934 **Barker, R. Wright; Brown, Noel K., Jr.** On the type locality of *Globorotalia foshi* Cushman and Ellisor: Micropaleontology, v. 14, no. 1, p. 114–116, illus., 1968.

The type locality of *Globorotalia foshi* is a core sample from a depth of 9,612 feet in H. J. Ellender no. 1 well as stated by the authors of the species, Cushman and Ellisor. Allegations to the contrary are refuted.—Authors' abstract

06868 **Barton, Paul B., Jr.** Possible role of organic matter in the precipitation of the Mississippi Valley ores, *in* Genesis of stratiform lead-zinc-barite-fluorite deposits (Mississippi Valley type deposits)—A symposium, New York, 1966: Econ. Geology Mon. 3, p. 371–377, illus., 1967.

Calculations based on the thermochemical stabilities of the ore and gangue minerals suggest that appreciable quantities of sulfate ion and methane should not coexist in an ore-forming environment. However, highly suggestive but unfortunately inconclusive observations do suggest that both methane and sulfate are present in amounts that are impossible to reconcile with the calculations based on the assumption of equilibrium. This paradox is tentatively interpreted to show that the ores were precipitated from solutions in which the heavy metals were carried as complex chloride ions whereas the sulfur exists metastably as sulfate ion. The sulfides were precipitated when the sulfate was reduced nonbiogenically to sulfide by methane or associated organic matter that was carried in, or encountered by, the ore-bearing aqueous fluid.—Author's abstract

Bastron, Harry. *See* Cannon, Helen L. 01034

06937 **Bayrock, L. A.** Surficial geology of the Wainwright area (east half), Alberta: Research Council Alberta Rept. 67-4, 10 p., illus., geol. maps, 1967.

The Wainwright area lies within the east-central Alberta Plains, a relatively flat, glaciated area underlain by gently dipping detrital strata of Late Cretaceous age. In most parts of the area, bedrock is overlain by till, as ground or hummocky moraine, the most common type of surficial deposit. Till, in turn, is overlain in many places by glacio-fluvial and lacustrine deposits, aeolian sands, and thin patches of Recent alluvial and lacustrine sediments. Examination of the glacial deposits and landforms suggests that they originated from large-scale downwasting and stagnation of the Keewatin ice-sheet, which advanced over the area during Pleistocene time. The glacial deposits are believed to be of Wisconsin age. [Surface geology is shown on eight separate maps in pocket].—Author's abstract

Beavers, A. H. *See* Ahmad, N. 01094

Beavers, A. H. *See* Ahmad, N. 01095

00784 **Bedinger, M. S.** Cypress Bayou, Grand Prairie region, Arkansas—An example of stream alienation, *in* Geological Survey research 1968, Chap. B: U.S. Geol. Survey Prof. Paper 600-B, p. B148-B150, illus., 1968.

Stream drainage in the Grand Prairie region of Arkansas is predominantly toward the southeast, following regional topographic slope. However, Cypress Bayou flows northward in the White River basin from a point near the Arkansas River, even though the valley of the bayou is open at its south end. The drainage divide between the Cypress Bayou basin and the Arkansas River basin is the summit of the natural levee of the Arkansas River. It is reasoned that the ancestral Cypress Bayou flowed southward into the Arkansas River, but that river alluviation blocked the bayou mouth, reversed the slope of the bayou valley, and forced the bayou to seek an outlet to the north over a low divide and into the White River basin. Thus, the mode of drainage-pattern change was the antithesis of stream piracy or capture and is herein referred to as 'stream alienation.'—*from* Author's abstract

00843 **Beer, Lawrence Peter.** Ground-water hydrology of southern Cache Valley, Utah [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 7, p. 2858B-2859B, 1968.

06847 **Bell, David L.; Goodell, H. Grant.** A comparative study of glauconite and the associated clay fraction in modern marine sediments: Sedimentology, v. 9, no. 3, p. 169-202, illus., 1967.

Glauconite and clay fraction were studied by X-ray diffraction from six contemporary marine environments. In areas where glauconite and clay are presently forming, the mineralogy and degree of crystallinity are similar. Known detrital glauconite is different, accordingly, from the clay fraction. Glauconite on Scotia Ridge is authigenic, that from Santa Monica Bay, Calif., is detrital. Pellets off the southeastern U.S. coast are both authigenic and detrital. The poor crystallinity exhibited by the Chatham Rise glauconite in contrast to the well crystallized associated clay fraction indicates they are not genetically related. However, the origin of this glauconite remains in doubt.—*from* Authors' summary

01014 **Benavides G., Luis; Sansores, Enrique.** Salt deposits of southern Mexico [abs.], *in* Saline deposits—Internat. Conf. Saline Deposits, Houston, Tex., 1962, Symposium: Geol. Soc. America Spec. Paper 88, p. 407-408, 1968.

01122 **Bender, Margaret M.; Bryson, Reid A.; Baerreis, David A.** University of Wisconsin radiocarbon dates IV: Radiocarbon, v. 10, no. 1, p. 161-168, 1968.

Radiocarbon dates obtained since November 1966 are summarized for archeologic samples from Wisconsin, Illinois, and Oklahoma; and geologic samples from Iowa, Manitoba, and Northwest Territories.—MCM

01137 **Benjamin, Jack R.** Probabilistic models for seismic force design: Am. Soc. Civil Engineers Proc., v. 94, paper 5950, Jour. Structural Div., no. ST5, p. 1175-1196, illus., tables, 1968.

The procedure consists of first forecasting the probabilities of occurrence and number of quakes of a given Modified Mercalli intensity at a site from the historical

record. The Poisson probability law is the most used model in earthquake forecasting, but the Bayesian statistical theory is more useful where mean rate of occurrence for events of main concern is not known. Forecasts are made for a 10-yr period for the San Francisco area, Calif. Three alternate designs for a structure are compared on the basis of expected losses, and the technique of estimating these losses for earthquakes of each intensity level is illustrated. Time-to-occurrence problems are discussed. More complex models, including the problem of occurrence, are introduced.—ESL

Bennison, Allan P. *See* Milton, Charles. 00798

01038 **Benson, G. T.; Kittleman, L. R.** Geometry of flow layering in silicic lavas: Am. Jour. Sci., v. 266, no. 4, p. 265–276, illus., 1968.

Numerous features are described, and several models of flows are outlined. The Littlefield Rhyolite flows in Oregon are an example of flows which have spread out over an open surface; the poles of flow layers in a small domain, plotted on an equal area net, fall in a partial girdle which defines a vertical great circle, with a maximum in the down-flow quadrant. The Watchman flow at Crater Lake is an example of a flow confined to a valley, the πS girdle is diffuse. The Llao Rock flow at Crater Lake is transitional, in that it filled a valley and then spilled out into the open. The geometry of flow layering in the rhyolite at Owyhee Dam corroborates the location of the conduit based on field evidence and indicates the utility of this type of study for determining direction of movement.—*from* Authors' abstract

01121 **Berger, Rainer; Libby, W. F.** UCLA radiocarbon dates VII: Radiocarbon, v. 10, no. 1, p. 149–160, 1968.

Reported measurements were carried out during the first half of 1967 on samples from the United States, Mexico, Asia, Europe, and Africa. Oceanic measurements are listed from the southern California coast, and from Central and South American marine shells series.—MCM

00940 **Berggren, William A.; Olsson, Richard K.; Reyment, Richard A.** Correction to—Origin and development of the foraminiferal genus *Pseudohastigerina* Banner and Blow, 1959: Micropaleontology, v. 14, no. 1, p. 132, 1968.

Corrections are made for figures and tables in the original paper (ibid., v. 13, no. 3, p. 265–288, 1967).—HRC

Bergman, S. C. *See* Pipiringos, G. N. 01108

00909 **Binda, P. L.; Srivastava, S. K.** Silicified megaspores from Upper Cretaceous beds of southern Alberta, Canada: Micropaleontology, v. 14, no. 1, p. 105–113, illus., 1968.

Silicified megaspores with well-preserved wall structure have been recovered from Upper Cretaceous bentonitic shales of southern Alberta. Two new genera are proposed. Nine new species belonging to five form genera, vis. *Henrisporites, Verrutriletes, Horstisporites, Stelckisporites*, new genus, and *Selenasporites*, new genus, are described. *Henrisporites* and *Verrutriletes* are suitably emended.—Authors' abstract

00969 **Bischoff, James L.** Kinetics of calcite nucleation—Magnesium ion inhibition and ionic strength catalysis: Jour. Geophys. Research, v. 73, no. 10, p. 3315–3322, illus., 1968.

Kinetics of calcite crystallization from dilute $MgCl_2$ solutions equilibrated with aragonite and atmospheric CO_2 were studied. Patterns of percent calcite against time and Mg^{++} concentration against time indicate Mg^{++} inhibits calcite nucleation and in the process is incorporated into the calcite lattice. Uptake of Mg^{++} by calcite nuclei was then used to monitor calcite nucleation rates under conditions of constant supersaturation and varying ionic strength. Nucleation rates were found to be proportional to the square root of the ionic strength. An analogy between

nucleation catalysis by ionic strength and colloid flocculation by salts in aqueous solution is suggested.—Author's abstract

Blair, Robert G. *See* Wallace, Stewart R. 00836

Blanchard, J. D. *See* Shaw, William S. 01020

06800 **Bleifuss, Rodney L.** The origin of the iron ores of southeastern Minnesota [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 6, p. 2475B–2476B, 1967.

Blow, W. H. *See* Eames, F. E. 01042

Boegly, W. J., Jr. *See* Bradshaw, R. L. 01118

00823 **Bohor, Bruce F.; Khandelwal, Suresh.** A new use for Illinois clay materials in pesticide formulations: Illinois Geol. Survey Indus. Minerals Note 33, 13 p., illus., tables, 1968.

Illinois clay materials display sufficient ranges of bulk density and sorption values to be considered for use as diluents (inert weighting agents) in granular pesticide formulations. Data on color, mineralogy, bulk density, sorption, and pH are presented for 37 Illinois clay materials and two out-of-state clays.—Authors' abstract

00916 **Bold, W. A. van den.** Ostracoda of the Yague Group (Neogene) of the northern Dominican Republic: Bulls. Am. Paleontology, v. 54, no. 239, 106 p., illus., tables, 1968.

One hundred and three species are reported, of which 13 are new, 50 have been described from elsewhere in the Caribbean, 13 are indicated by affinity, and 26 remain unnamed. Throughout the Yague Group the ostracode fauna remains similar, but several species appear to have restricted ranges, by means of which it is possible to recognize five ostracod association zones. The boundaries are vague, however, and their stratigraphic significance is still uncertain; they do not parallel formation boundaries. The fauna of the Gurabo Formation shows affinity to that of the Springvale Formation (Trinidad) and the Bowden Formation on Jamaica. The Gurabo probably transgresses over the Cercado Formation.—*from* Author's abstract

01070 **Bolli, H. M.; Boudreaux, J. E.; Emiliani, Cesare; Hay, W. W.; Hurley, R. J.; Jones, J. I.** Biostratigraphy and paleotemperatures of a section cored on the Nicaragua Rise, Caribbean Sea: Geol. Soc. America Bull., v. 79, no. 4, p. 459–470, illus., 1968.

The drilling vessel was used to drill and core sediments to a depth of 56.4 m on the Nicaragua Rise, between Walton Bank and Jamaica, in 610 m of water. Seismic reflection profiles revealed thick accumulations of layered sediments with some fossil reefs. Taxonomic analysis of the calcareous nannoplankton indicates that the level at 2,354 cm correlates with the midportions of the eastern equatorial Pacific cores 58 and 62, with the "Nebraskan–Aftonian" boundary of the Gulf Coast, and with the appearance of *Hyalinea baltica* at Le Castella, southern Italy. This level, therefore, represents the Plio–Pleistocene boundary as officially designated, and an age of about 700,000 years is estimated for the boundary. Oxygen isotopic analysis shows important oscillations, with a full glacial–interglacial amplitude, occurring both above and below the Plio–Pleistocene boundary.—*from* Authors' abstract

06801 **Bordeau, Kenneth V.** Micropaleontology of the Fernvale Formation of Tennessee and Oklahoma [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 6, p. 2476B, 1967.

00847 **Bork, Kennard Baker.** Bryozoa (Ectoprocta) of Champlainian age (Middle Ordovician) from northwestern Illinois, northeastern Iowa, and southwestern Wisconsin [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 7, p. 2898B–2899B, 1968.

Boudreaux, J. E. *See* Bolli, H. M. 01070

Boutwell, Gordon P., Jr. *See* Vesić, Aleksandar S. 06932

Bradbury, J. C. *See* Grogan, Robert M. 06878

01118 **Bradshaw, R. L.; Empson, F. M.; Boegly, W. J., Jr.; Kubota, H.; Parker, F. L.; Struxness, E. G.** Properties of salt important in radioactive waste disposal, *in* Saline deposits—Internat. Conf. Saline Deposits, Houston, Tex., 1962, Symposium: Geol. Soc. America Spec. Paper 88, p. 643–658, illus., tables, 1968.

Laboratory and field tests have been conducted on the properties of salt which are important in the design and operation of a waste-disposal facility. *In situ* heat transfer properties are very close to laboratory calculations. Most bedded salt contains water which is violently released at temperatures over 250°C. Radiation exposure doses of 5×10^8 roentgens produce some changes in structural properties, but the effect on mine stability should be negligible. Rock salt is about the same as concrete as a gamma-radiation shield. Stability of a waste-disposal mine at ambient temperatures can be predicted from observed conditions in existing salt mines. Elevated temperatures will cause accelerated creep, but the exact effects on structural stability cannot be predicted accurately.—*from* Authors' abstract

Breckenridge, W. J. *See* Ross, B. A. 00818

Bredell, G. S. *See* Eaton, Frank M. 01067

Brekke, Tor L. *See* Goodman, Richard E. 01005

Briden, J. C. *See* McElhinny, M. W. 01101

01015 **Briggs, Louis I.** Evaporite deposits of the United States [abs.], *in* Saline deposits—Internat. Conf. Saline Deposits, Houston, Tex., 1962, Symposium: Geol. Soc. America Spec. Paper 88, p. 408, 1968.

06781 **Brindley, G. W.** Silicate swelling in water and in organic media, *in* Layer silicates—A.G.I. short course lecture notes, New Orleans, La., Nov. 17–19, 1967: Washington, D.C., Am. Geol. Inst., p. GWB1B–GWB43B, illus., tables, 1967.

Interlayer or intracrystalline swelling and interparticular swelling are described, followed by a brief description of the experimental methods used (largely X-ray diffraction techniques). Interlayer hydration in smectites and vermiculites is outlined also. Interlayer organic sorption is discussed, including the mechanism of sorption and complexes formed by cation exchange reactions and by polar molecules with and without hydrogen bonding possibilities. Specific results in the swelling of kaolinite minerals, both natural and by intercalation or intersalation complexes, and the swelling of micas, chlorites, and mixed-layer minerals, are described.—HRC

06833 **Brindley, G. W.** Nomenclature, geometry of ideal layers, bonding, *in* Layer silicates—A.G.I. short course lecture notes, New Orleans, La., Nov. 17–19, 1967: Washington, D.C., Am. Geol. Inst., p. GWB1A–GWB25A, illus., tables, 1967.

Regarding nomenclature, the recommendations of national and international organizations are reviewed, and special emphasis is placed upon the nomenclature of polysilicates. Problems related to kaolinite and halloysite are discussed along with a few other polysilicates. First approximations and the Radoslovich model of ideal layers are described, followed by criticisms of the model and predictions of layer structures. Interlayer and intralayer bonding are discussed also.—HRC

06834 **Brindley, G. W.** Disorder in phyllosilicates, *in* Layer silicates—A.G.I. short course lecture notes, New Orleans, La., Nov. 17–19, 1967: Washington, D.C., Am. Geol. Inst., p. GWB1C–GWB33C, 1967.

The varieties of order and disorder, coupled with the intensity of diffracted X-rays, are discussed. Disorder can come about by thermal vibrations, cation disturbances, and from the stacking of layers of essentially the same structural type and also

of essentially different structural types. Other minor forms of disorder are described also. Theoretical and naturally occurring examples are cited.—HRC

00808 **Bristol, Hubert M.** Structure of the base of the Mississippian Beech Creek (Barlow) Limestone in Illinois: Illinois Geol. Survey Illinois Petroleum 88, 12 p., illus., table, 1968.

The lower part of the Chesterian (Upper Mississippian) and the upper part of the Valmeyeran (Middle Mississippian) include the most prolific oil reservoirs in Illinois. A structure map on the base of the Beech Creek (Barlow) Limestone shows the configuration of these strata in the major oil producing portion of Illinois. Five variations in the appearance of the Beech Creek on electric logs are illustrated. A list of ozalid maps shows additional Beech Creek data obtainable from the Illinois Geological Survey.—*from* Author's abstract

Brock, A. *See* McElhinny, M. W. 01101

00992 **Brock, M. R.; Singewald, Q. D.** Geologic map of the Mount Tyndall quadrangle, Custer County, Colorado: U.S. Geol. Survey Geol. Quad. Map GQ-596, 2 sheets, scale 1:24,000, separate text, sections, 1968.

The second map sheet is an overlay indicating location of thorium deposits and associated radioactivity in the Mount Tyndall quadrangle. The text contains descriptions of the map units, notes on geology (nonmetamorphosed intrusive and related rocks and gneissic crystalline complex) and information on economic geology. Thorite is the principal thorium mineral, but its erratic concentration makes prediction of grade hazardous. The Bassick mine has a recorded gold production of about one-and-a-half million dollars. Small amounts of barite and vermiculite are present also.—MCM

06819 **Brophy, John A.** Some aspects of the geological deposits of the south end of the Lake Agassiz basin, *in* Life, land and water—Conference on environmental studies of the Glacial Lake Agassiz region, 1966, Proc.: Manitoba Univ. Dept. Anthropology Occasional Paper 1, p. 97-105, illus., 1967.

In the area of the Sheyenne Delta, near Fargo, N. D., four units can be recognized from road cuts and bore holes. The base is clay, deposited in the lake upon till, and is 70 feet thick; this is overlain by 3 feet of clay and silt, unoxidized; over this is a thin (2 feet to 6 inches) highly carbonaceous, unoxidized, laminated silt zone. At the top is 28 feet of thin-bedded, some cross-bedded, silt and clay, of which only the lower two feet is unoxidized. The carbonaceous material is 9,900 years old. The details of the relationship of this sequence to the glacial lake, glacial advance, and post-glacial erosion are discussed.—HRC

00929 **Brown, George D.; Anstey, Robert L.** Lexington Limestone-Kope Formation contact (Ordovician) in southeastern Indiana: Am. Assoc. Petroleum Geologists Bull., v. 52, no. 3, p. 488-493, illus., table, 1968.

The contact between the Lexington Limestone and Kope Formation is placed at the change in limestone lithologic types. Below the contact biosparrudite and biosparite are common; above they are absent.—WCC

06879 **Brown, J. S.** (editor). Genesis of stratiform lead-zinc-barite-fluorite deposits (Mississippi Valley type deposits)—A symposium, New York, 1966: Econ. Geology Mon. 3, 443 p., illus., 1967.

This symposium on genesis of stratiform type of ore deposits in carbonate rocks was sponsored by UNESCO, the John Lindsley Foundation, the International Union of Geological Sciences, and the Society of Economic Geologists. Discussions were limited to deposits in regions of moderate or slight metamorphisms which were clearly representative of this type. Forty-four papers are included grouped in three parts: the North American scene, the European scene, and geochemical aspects (solution chemistry and isotopic evidence). Oral discussions to papers are included. Eighteen papers are cited separately.—VSN

06873 **Brown, John S.** Isotopic zoning of lead and sulfur in southeast Missouri, *in* Genesis of stratiform lead-zinc-barite-fluorite deposits (Mississippi Valley type deposits)—A symposium, New York, 1966: Econ. Geology Mon. 3, p. 410-425, illus., tables, 1967.

Isotopic studies show that all ore lead in the Paleozoic beds of southeastern Missouri is anomalous, of J-type, varying considerably within deposits. The conclusion is that radiogenic lead from the Precambrian basement mingled with normal lead in the connate fluids of the sediments to yield the anomalous hybrids. The relative proportion of the basement contribution possibly was on the order of one-third of total lead.—*from* Author's abstract

06923 **Brown, Jon T.** The "associated minerals' dilemma and the new federal oil shale policy: Rocky Mtn. Mineral Law Rev., v. 5, no. 1, p. 1-17, reprinted 1967.

Legal problems in development of federally-owned oil shale lands, in the Piceance Creek basin of Colorado, are increased by potential value of associated dawsonite and nahcolite. A law of 1954, for multiple development of different minerals on the same land, and subsequent legislation have not yet solved such problems of comingled leasable and locatable minerals in the same matrix as "value", and simultaneous development by different interests. Extensive geological surveying could determine feasibility of multiple mineral development; leases for "shalite" rather than oil shale may ensure complete development.—GDC

Brown, Noel K., Jr. *See* Barker, R. Wright, 00934

00813 **Brown, Randall E.** A study of reported faulting in the Pasco Basin: Battelle Memorial Inst., Pacific Northwest Lab., Richland, Wash., Rept. BNWL-662, 55 p., illus., 1968.

While reconnaissance studies in south-central Washington have commonly suggested major faults, detailed studies have emphasized their importance. Faulting developed simultaneously with slow folding, or in later stages, and occurs where stresses were not relieved solely by folding. Movement was probably by slow slippage unaccompanied by earthquakes. No evidence suggests abrupt movement, particularly in Recent time, although folding and uplift are continuing. The Olympic-Wallowa lineament does not exist, as a through-trending tectonic feature, from Wallula Gap to Rattlesnake Hill. Landslides appear to be due to Pleistocene flooding of the basin, and to irrigation, and excessive precipitation. Clastic dikes in mid-Quaternary deposits may reflect very shallow seated earthquakes of local extent.—*from* Author's summary

Browning, J. S. *See* Hollenbeck, R. P. 06922

06912 **Brush, Grace S.** Pollen analyses of late-glacial and postglacial sediments in Iowa, *in* Quaternry paleoecology—Internat. Assoc. Quaternary Research, 7th Cong., 1965, Proc., V. 7: New Haven, Conn., Yale Univ. Press, p. 99-115, illus., table, 1967.

Pollen from three bogs on Des Moines-lobe drift show a sequence from fir-spruce forests to coniferous-deciduous forests, followed by a succession of chenopods and oak-grasslands. The bog successions, on Cary till, cover 14,500 years during which time the climate ranged from cold to warm and then to warm and dry. No reversions of climate are seen in the profiles. Two types of profiles were constructed: the conventional type, based on percentages within 500 grains; and a pollen-density profile constructed from the actual number of grains per unit weight of sediment. The numbers vary significantly vertically from more than 100,000 per gram at one level to less than 100 at other levels. In some samples, no pollen was recovered.—*from* Author's abstract

01080 **Bruun, Per.** Model geology—Prototype and laboratory streams—Reply [to discussion by R. LeB. Hooke, of 1966 paper]: Geol. Soc. America Bull., v. 79, no. 3, p. 395-398, illus., 1968.

Bruun's discussion of Hooke's remarks (ibid., p. 391–393) takes the form of bringing the reader up to date on results achieved since 1964, when the article under discussion (ibid., v. 77, no. 9, p. 959–973, 1966) was written. A list of references, most of which have been published since 1964, is included.—VSN

Bryson, Reid A. *See* Bender, Margaret M. 01122

06832 **Bryson, Reid A.; Wendland, Wayne M.** Tentative climatic patterns for some late glacial and post-glacial episodes in central North America, *in* Life, land and water—Conference on environmental studies of the Glacial Lake Agassiz region, 1966, Proc.: Manitoba Univ. Dept. Anthropology Occasional Paper 1, p. 271–298, illus., 1967.

An internally consistent matching of climatic patterns and biotic evidence can be made for the past 10,000 years. The relationship of biotic distribution to glacial maxima and minima is discussed, as are climatic zones. Reconstructions of past airmass regimes are attempted, based largely upon pollen spectra. The late glacial climatic pattern is outlined and compared with the boreal forest pattern. The Atlantic and post-Atlantic patterns are also described in detail.—HRC

00886 **Budge, Wallace Don.** A method of identification and volume change prediction of a stiff, fissured clay shale [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 7, p. 2828B–2829B, 1968.

00789 **Bunker, Carl M.; Bush, Charles A.** Radioelement composition of surface soil in Adams County, Colorado, *in* Geological Survey research 1968, Chap. B: U.S. Geol. Survey Prof. Paper 600-B, p. B71–B75, illus.; 1968.

Eighty-three samples [of soil] collected from the Bennett, Manila, Horse Creek, and Sunnydale 7 1/2 minute quadrangle areas near Denver, Colo., were analyzed to determine the radioelement content and distribution. The radioelement concentrations are: 7.7 to 19.0 ppm thorium, 0.7 to 3.3 ppm radium-equivalent uranium, and 2.07 to 3.75 percent potassium. These data provide ground control for a proposed calibration of the U.S. Geological Survey's airborne gamma radiation detection systems.—Authors' abstract

01124 **Burch, Stephen H.** Tectonic emplacement of the Burro Mountain ultramafic body, Santa Lucia Range, California: Geol. Soc. America Bull., v. 79, no. 5, p. 527–544, illus., tables, 1968.

The Burro Mountain body is a crudely equidimensional block of ultramafic rock that, along with numerous smaller serpentinite bodies, has been emplaced in a highly sheared Franciscan terrane. Within the Burro Mountain body the primary rock types are: peridotite (65 percent), dunite (35 percent), and pseudopyroxenite (<1 percent). Variations among these lithologic types produce two sets of internal structures one of which is thought to have been formed by metamorphic differentiation, the other by metasomatic replacement. Tectonic emplacement is demonstrated by discordance of internal versus regional structure, discrepancy of metamorphic grade between ultramafic and country rock, lack of igneous contacts, and extreme marginal shearing.—*from* Author's abstract

06796 **Burfeind, Walter John.** A gravity investigation of the Tobacco Root Mountains, Jefferson Basin, Boulder batholith, and adjacent areas of southwestern Montana [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 6, p. 2489B, 1967.

00868 **Burford, Robert Oliver.** Strain analysis across the San Andreas fault and Coast Ranges of California [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 7, p. 2909B, 1968.

06927 **Burger, H. Robert, 3d.** Bedrock geology of the Sheridan district, Madison County, Montana: Montana Bur. Mines and Geology Mem. 41, 22 p., illus., tables, geol. maps, 1967.

On the western flank of the Tobacco Root Mts., exposed metamorphic bedrock, decreasing in rank northward, is divided into four mappable gneissic units and two

marble beds. Petrographic, modal, and chemical analyses indicate an original 9,000-ft sedimentary sequence interbedded with chert, basic sills and flows, and ultrabasic intrusives. Geologic map patterns delineate slightly overturned, isoclinal folds plunging NW and one nappe structure. Nearby vertical joint systems, developed in Precambrian and Laramide deformations, controlled intrusion of the Tobacco Root batholith and orientations of three major faults associated with the Laramide orogeny. Ore mineralization occurred with Tertiary intrusion of quartz-monzonite stocks in contact with marble, and in fissure veins. A geologic map and one showing major tectonic elements and mine locations are included.—GDC

Burlingame, A. L. *See* Huag, Pat. 00914

01098 **Burlingame, A. L.; Simoneit, B. R.** Isoprenoid fatty acids isolated from the kerogen matrix of the Green River Formation (Eocene): Science, v. 160, no. 3827, p. 531–533, illus., 1968.

Demineralized oil shale was oxidized with chromic acid, and C–14 to C–22 isoprenoid fatty acids were isolated and identified. The major components of the branched-chain acid fraction after successive 3-, 6-, and 15-hour oxidations are C–15 and C–16 branched-chain acids; C–17, C–19 (norphytanic acid), and C–20 (phytanic acid) were obtained in lower concentration; no C–18 product was obtained. Separations were effected by column and gas-liquid chromatography, and the structures of individual components were determined by high- and low-resolution mass spectrometry.—Authors' abstract

Burton, L. C. *See* Wood, P. R. 00820

Bush, Charles A. *See* Bunker, Carl M. 00789

01149 **Butler, J. Robert; Dunn, David E.** Geology of the Sauratown Mountains anticlinorium and vicinity, *in* Guidebook for field excursions, Geol. Soc. America, Southeastern Sec., Durham, N. C., April, 1968: Southeastern Geology Spec. Pub. 1, p. 19–47, illus., geol. maps, 1968.

The Sauratown Mountains are a series of quartzite ridges north of Winston-Salem. The quartzites are up to 200 feet thick locally, are interbedded in foliated metamorphic rocks, and grade laterally into schist and gneiss; they are not exposed as windows as earlier thought. A synclinorium axis just north of the mountains may be an extension of the James River synclinorium of Virginia. Rocks in the synclinorium can be traced more than 95 miles, and into the Brevard Zone toward the southwest. The regional metamorphic grade is upper greenschist facies and increases to lower amphibolite facies within a few miles to the southwest. The Stony Ridge fault zone lies to the south of the anticlinorium. At least part of the area was rejuvenated during the Triassic.—*from* Authors' abstract

01052 **Buturla, Frank, Jr.** Geology and ground water resources of Wells County—Pt. 2, Ground water basic data: North Dakota Geol. Survey Bull. 51, pt. 2 ((North Dakota Water Comm. County Ground Water Study 12), 118 p., illus., tables, 1968.

Records of about 775 wells and test holes are tabulated and include depth of well, depth to water, aquifer, and lithology. A record of 11 springs is included. Water-level measurements in 67 observation wells, over periods of one to three years, and logs of about 240 test holes and selected wells are given. Chemical analyses of 76 water samples are tabulated, and the source and significance of constituents are discussed briefly. A map showing the location of wells, springs, and test holes accompanies the report.—ESL

00943 **Byrne, John V.; Kulm, LaVerne D.** Natural indicators of estuarine sediment movement—Closure [to discussion of paper 5220, 1967]: Am. Soc. Civil Engineers Proc., v. 94, paper 5924, Jour. Waterways and Harbors Div., no. WW2, p. 242–244, 1968.

The writers believe that other factors, such as geography and eolian transport, are more important than the Coriolis effect in the distribution of sediments on the tidal flats of Yaquina Bay, Oreg. The Coriolis effect was found to be an important

factor in southeastern estuaries by Neiheisel and Weaver. Both studies suggest the use of natural indicators rather than expensive tracers.—ESL

06843 **Cailleux, André; Hamelin, Louis-Edmond.** Périglaciaire actuel sur le littoral du Bic (Bas-Saint-Laurent): Cahiers Géographie Québec, v. 11, no. 23, p. 361–378, illus., table, 1967.

A new type of shoreline marsh, a cellular marsh, is described from the lower Saint Lawrence estuary. More generally, it shows a number of aspects of both fresh water and marine ice, or of glaciers. It is a result of the action of the vegetable and mineral kingdom together. Schists are weathered and "jellied" by the freshwater periglacial climate, and the waves move the material away in pieces to be deposited in a different place and then acted upon by the usual marsh processes, but differentially from the material *in situ*. The result is a marsh with differential formation which is cellular or perforated in nature.—*from* Authors' conclusions

01154 **California Dept. Water Resources.** Hydrologic data, 1966—V. 1, North coastal area—App. C, Ground water measurements; App. D, Surface water quality; App. E, Ground water quality: California Dept. Water Resources Bull. 130–66, v. 1, app. C–E, p. 39–109, illus., tables, 1968.

Ground-water level measurements from 50 wells in nine ground-water basins for the period July 1, 1965 through Sept. 30, 1966 are summarized in a table. Surface-water quality data were collected from 27 stream stations in the period Oct. 1, 1965 through Sept. 30, 1966. Analysis for mineral constituents and trace elements followed U.S. Geological Survey methods; both are tabulated. Ground-water quality data were collected from Oct. 1, 1965 through Sept. 30, 1966; major ground-water sources sampled included 80 wells in 11 ground-water basins. Mineral and trace-element analyses are tabulated.—ESL

06893 **California Dept. Water Resources.** Hydrologic data, 1966—V. 2, Northeastern California—App. C, Ground water measurements: California Dept. Water Resources Bull. 130–66, v. 2, app. C, 130 p., illus., tables, 1967.

The report contains data on ground water conditions in northeastern California during the 1965–66 water year. Figures show location of ground-water basins and fluctuation of water level in wells. Plates show contour lines of elevation of water level in wells. Tables show average change of ground-water levels and ground-water level measurements.—Author's abstract

06894 **California Dept. Water Resources.** Hydrologic data, 1966—V. 4, San Joaquin Valley—App. C, Ground water measurements; App. D, Surface water quality; App. E, Ground water quality: California Dept. Water Resources Bull. 130–66, v. 4, app. C–E, p. 167–455, illus., tables, 1967.

Ground-water measurement data on 800 selected wells for the period July 1, 1965 through June 30, 1966 are tabulated. Fluctuations of average water level in selected areas and fluctuation of water levels in selected wells are shown on graphs. Surface-water quality data were collected from 34 stations during water year 1966. Mineral and trace-element analyses, and miscellaneous constituents are tabulated. During the 1966 water year, 1,050 wells were sampled and mineral and trace-elements analyses tabulated.—ESL

01138 **Calkin, Parker E.** Glaciolacustrine strand lines and late Pleistocene history of Lake Erie basin, northwestern New York—A progress report: Coastal Research Notes, v. 2, no. 7, p. 15–20, table, 1968.

Within 25 mi of Buffalo, 8 or 10 pre-Lake Erie lake levels are in evidence; the oldest, highest, and best developed strand line is correlated with glacial Lake Whittlesey, between Port Huron, Mich., and Valley Heads, N.Y. The Lake Whittlesey shale shingle is stronger than lower sandy strands of younger Lake Warren, whose discontinuous spits and bars of variable trends display effects of strong SW winds and waves large enough to build 12-ft ridges close to the glacier's stand near Alden. The lowest Warren beach is derived from Alden moraine boulders 2 to 6 feet in diameter. Variable composition and multiple trends of the Warren

beaches may be explained by greater fetch or common seiche effects. Closer to the Lake Erie shore, beach materials are almost absent, the low slope having allowed extensive spreading with slight lake-level changes. Post-Warren lake stages must have been very brief.—GDC

06857 **Callahan, William H.** Some spatial and temporal aspects of the localization of Mississippi Valley-Appalachian type ore deposits, *in* Genesis of stratiform lead-zinc-barite-fluorite deposits (Mississippi Valley type deposits)—A symposium, New York, 1966: Econ. Geology Mon. 3, p. 14–18, illus., table, 1967.

Features controlling localization of Mississippi Valley type base-metal ore deposits are derivatives of paleophysiography: (1) specific sedimentary environments related to the topographic relief on an unconformity below; (2) solution collapse breccias and structures related to an unconformity above but containing no stalactites and stalagmites; (3) facies changes not clearly related to an unconformity. Appalachian type ore deposits are merely folded Mississippi Valley type. It is postulated that the mineralization is related to events about contemporaneous with formation of the host rock. Chlorides in fluid inclusions of some of the sulfide in these deposits suggest a marine component in mineralization. A volcanic source for the metal ions is invoked; difference in character of mineralization between districts may be a function of distance from source.—*from* Author's abstract

06862 **Campbell, Neil.** Tectonics, reefs and stratiform lead-zinc deposits of the Pine Point area, Canada, *in* Genesis of stratiform lead-zinc-barite-fluorite deposits (Mississippi Valley type deposits)—A symposium, New York, 1966: Econ. Geology Mon. 3, p. 59–67, illus., table, 1967.

Stratiform lead-zinc deposits at Pine Point are in gently-dipping middle Devonian carbonate sediments 20 to 50 miles from the Precambrian Shield. Major Precambrian faults underlie the ore bodies and provided the locus for a chain of events including development of a great barrier reef in the Devonian, subsequent shattering and recrystallization of the reef and deposition of lead, zinc, and iron sulfide ore bodies. It seems probable that deposition of ore was brought about by thermal waters arising from, but not necessarily originating at, great depth. At Pine Point the relation between basement structures and overlying facies variations, metamorphism, and mineralization can be observed. It is postulated that in some other areas of stratiform lead-zinc deposition, similar zones of repeated crustal strain may exist.—*from* Author's abstract

00742 **Canada Geological Survey.** Aeromagnetic map, Big North Lake, District of Kenora, Ontario: Canada Geol. Survey Geophysics Paper 3750, scale 1:63,360, 1968.

00743 **Canada Geological Survey.** Aeromagnetic map, Long Dog Lake, District of Kenora, Ontario: Canada Geol. Survey Geophysics Paper 3751, scale 1:63,360, 1968.

00744 **Canada Geological Survey.** Aeromagnetic map, Sheet 53 H/11, District of Kenora, Ontario: Canada Geol. Survey Geophysics Paper 3752, scale 1:63,360, 1968.

00745 **Canada Geological Survey.** Aeromagnetic map, Otter River, District of Kenora, Ontario: Canada Geol. Survey Geophysics Paper 3753, scale 1:63,360, 1968.

00746 **Canada Geological Survey.** Aeromagnetic map, Crandall Falls, District of Kenora, Ontario: Canada Geol. Survey Geophysics Paper 3754, scale 1:63,360, 1968.

00747 **Canada Geological Survey.** Aeromagnetic map, Sheet 53 I/6, District of Kenora, Ontario: Canada Geol. Survey Geophysics Paper 3755, scale 1:63,360, 1968.

00748 **Canada Geological Survey.** Aeromagnetic map, Sheet 53 I/11, District of Kenora, Ontario: Canada Geol. Survey Geophysics Paper 3756, scale 1:63,360, 1968.

00749 **Canada Geological Survey.** Aeromagnetic map, Sheet 53 I/14, District of Kenora, Ontario: Canada Geol. Survey Geophysics Paper 3757, scale 1:63,360, 1968.

00750 **Canada Geological Survey.** Aeromagnetic map, Many Branches Lake, District of Kenora, Ontario: Canada Geol. Survey Geophysics Paper 3758, scale 1:63,360, 1968.

00751 **Canada Geological Survey.** Aeromagnetic map, Sheet 53 P/6, District of Kenora, Ontario: Canada Geol. Survey Geophysics Paper 3759, scale 1:63,360, 1968.

00752 **Canada Geological Survey.** Aeromagnetic map, Sheet 53 P/11, District of Kenora, Ontario: Canada Geol. Survey Geophysics Paper 3760, scale 1:63,360, 1968.

00753 **Canada Geological Survey.** Aeromagnetic map, Sheet 53 P/14, District of Kenora, Ontario: Canada Geol. Survey Geophysics Paper 3761, scale 1:63,360, 1968.

00754 **Canada Geological Survey.** Aeromagnetic map, Sheet 54 A/3, District of Kenora, Ontario: Canada Geol. Survey Geophysics Paper 3762, scale 1:63,360, 1968.

00755 **Canada Geological Survey.** Aeromagnetic map, Sheet 54 A/6, District of Kenora, Ontario: Canada Geol. Survey Geophysics Paper 3763, scale 1:63,360, 1968.

00756 **Canada Geological Survey.** Aeromagnetic map, Sheet 54 A/11, Kenora and Winnipeg mining districts, Manitoba–Ontario: Canada Geol. Survey Geophysics Paper 3764, scale 1:63,360, 1968.

00757 **Canada Geological Survey.** Aeromagnetic map, Milk Creek,Kenora and Winnipeg mining districts, Manitoba–Ontario: Canada Geol. Survey Geophysics Paper 3765, scale 1:63,360, 1968.

00758 **Canada Geological Survey.** Aeromagnetic map, Sheet 42 K/11, District of Cochrane, Ontario: Canada Geol. Survey Geophysics Paper 3868, scale 1:63,360, 1968.

00759 **Canada Geological Survey.** Aeromagnetic map, Sheet 42 K/14, District of Cochrane, Ontario: Canada Geol. Survey Geophysics Paper 3869, scale 1:63,360, 1968.

00760 **Canada Geological Survey.** Aeromagnetic map, Quantz Lake, District of Cochrane, Ontario: Canada Geol. Survey Geophysics Paper 3870, scale 1:63,360, 1968.

00761 **Canada Geological Survey.** Aeromagnetic map, Chard River, Districts of Kenora and Cochrane, Ontario: Canada Geol. Survey Geophysics Paper 3871, scale 1:63,360, 1968.

00762 **Canada Geological Survey.** Aeromagnetic map, Muswabik River, Districts of Kenora and Cochrane, Ontario: Canada Geol. Survey Geophysics Paper 3872, scale 1:63,360, 1968.

00763 **Canada Geological Survey.** Aeromagnetic map, Sheet 42 N/14, District of Kenora, Ontario: Canada Geol. Survey Geophysics Paper 3873, scale 1:63,360, 1968.

00764 **Canada Geological Survey.** Aeromagnetic map, Kapiskau Lake, District of Kenora, Ontario: Canada Geol. Survey Geophysics Paper 3874, scale 1:63,360, 1968.

00765 **Canada Geological Survey.** Aeromagnetic map, Missisa Lake, District of Kenora, Ontario: Canada Geol. Survey Geophysics Paper 3875, scale 1:63,360, 1968.

00766 **Canada Geological Survey.** Aeromagnetic map, Sheet 43 C/11, District of Kenora, Ontario: Canada Geol. Survey Geophysics Paper 3876, scale 1:63,360, 1968.

00767 **Canada Geological Survey.** Aeromagnetic map, Artillery Lake, District of Mackenzie, Northwest Territories: Canada Geol. Survey Geophysics Paper 7192, scale 1:253,440, 1968.

00768 **Canada Geological Survey.** Aeromagnetic map, Healey Lake, District of Mackenzie, Northwest Territories: Canada Geol. Survey Geophysics Paper 7198, scale 1:253,440, 1968.

00769 **Canada Geological Survey.** Aeromagnetic map, Beechey Lake, District of Mackenzie, Northwest Territories: Canada Geol. Survey Geophysics Paper 7204, scale 1:253,440, 1968.

00770 **Canada Geological Survey.** Aeromagnetic map, Baillie River, District of Mackenzie, Northwest Territories: Canada Geol. Survey Geophysics Paper 7859, scale 1:253,440, 1968.

00771 **Canada Geological Survey.** Aeromagnetic map, Duggan Lake, District of Mackenzie, Northwest Territories: Canada Geol. Survey Geophysics Paper 7873, scale 1:253,440, 1968.

06898 **Canada Geological Survey.** Aeromagnetic map, Nanaimo Lakes, Vancouver Island, British Columbia: Canada Geol. Survey Geophysics Paper 5322, scale 1:63,360, 1967.

06899 **Canada Geological Survey.** Aeromagnetic map, Alberni Inlet, Vancouver Island, British Columbia: Canada Geol. Survey Geophysics Paper 5323, scale 1:63,360, 1967.

00848 **Canis, Wayne Francis.** Conodonts and biostratigraphy of the Lower Mississippian of Missouri [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 7, p. 2899B, 1968.

01034 **Cannon, Helen L.; Shacklette, Hansford T.; Bastron, Harry.** Metal absorption by *Equisetum* (horsetail): U.S. Geol. Survey Bull. 1278-A, p. A1-A21, illus., tables, 1968.

Samples of *Equisetum* (horsetail), collected from a variety of mineralized and unmineralized areas throughout conterminous U.S. and Alaska, were analyzed for 28 elements to determine whether this plant is an accumulator of metals. Metal content from 15 mineralized areas was generally lower than that of other plants growing there; gold contents in the ash averaged only 0.17 ppm in conterminous U.S. and 0.54 ppm in Alaska. Early reports of large amounts of gold may be erroneous; a study of analytical procedures used suggests that other metals, in addition to gold, were measured and reported as amounts of gold. *Equisetum* consistently accumulates zinc in amounts greater than are in the substrate; commonly these amounts are also greater than those in other plants that grow in the same soil; it is, therefore, an accumulator of zinc, but not an accumulator of gold.—*from* Authors' abstract

06874 **Cannon, R. S.; Pierce, A. P.** Isotopic varieties of lead in stratiform deposits, *in* Genesis of stratiform lead-zinc-barite-fluorite deposits (Mississippi Valley type deposits)—A symposium, New York, 1966: Econ. Geology Mon. 3, p. 427-433, illus., 1967.

Stratiform lead-zinc-barite-fluorite deposits include two distinct types of lead isotope. Most deposits in Europe and adjacent areas contain ordinary ore-lead, almost invariant in isotopic composition that originated during a relatively short span of geologic time in a uniform source, probably the mantle. Deposits in the central lowland of North America contain J-lead of variable isotopic composition, part or all of which originated by mobilization of rock-lead from the Precambrian basement or enclosing marine sedimentary rocks. Exceptions to these patterns—

Pine Point in Canada and deposits of Laisvall-type in Sweden and Norway—are likely to be of special interest.—*from* Authors' abstract

01007 **Card, K. D.** Geology of the Denison-Waters area, District of Sudbury: Ontario Dept. Mines Geol. Rept. 60, 63 p., illus., tables, geol. map, 1968.

Precambrian stratigraphy and structure and economic geology south of Sudbury, Ontario, are described. Mafic metavolcanics with sedimentary interbeds are intruded by rhyolitic bodies, the largest being Copper Cliff quarried for smelter flux; a composite granitic body is the Creighton pluton. Thick overlying metasediments are divided into five units, correlatable with Mississagi formations of the Blind River area. Explosive gabbroic intrusions formed Sudbury-type breccias; the nickel irruptive and Worthington offshoot dike are extensively altered. The Penokean orogeny left northeast-trending faults and doubly-plunging folds with gneissic and schistose lineations. The Grenville orogeny renewed fault activity; younger diabase and trap dikes trend northwest. Pleistocene glaciation removed soil and left commercial deposits of sand and gravel. Numerous sulfide occurrences have been explored; two were operating in 1965.—GDC

Careaga, Jose. *See* Fernandez, Luis M. 00954

01157 **Carlson, C. E.** Here's more on Triassic, Jurassic in Rockies, Canada: Oil and Gas Jour., v. 66, no. 3, p. 132-138, illus., 1968.

This article is a condensation of a paper by the author and H. A. Gibson presented at the 17th Annual Meeting of the Rocky Mountain Section of the American Association of Petroleum Geologists. It discusses the paleogeography, thickness, and facies of Triassic and Jurassic rocks in Alberta, Saskatchewan, Manitoba, Montana, and North Dakota, and describes briefly the occurrence of oil and gas in those rocks.—PTH

Carlson, J. E. *See* Gibbs, J. F. 00793

00873 **Carlson, Paul Roland.** Marine geology of Astoria submarine canyon [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 7, p. 2974B, 1968.

Carmichael, I. S. E. *See* Lindsley, D. H. 00970

00977 **Carr, P. A.** Stratigraphy and spore assemblages, Moncton map-area, New Brunswick: Canada Geol. Survey Paper 67-29, 47 p., illus., tables, geol. map, 1968.

Geological studies and spore determinations in Moncton map-area have shown the need for clarification and modification of stratigraphic terms. Four of the seven Carboniferous units—the Memramcook, Boss Point, Salisbury, and Richibucto Formations—are time-transgressive so that it seems advisable to stop using the terms Pictou, Riversdale, and Horton because of their time-stratigraphic aspect. Dropping the name 'Scoudouc Formation' is advocated because the rocks have now been included in the Salisbury Formation and the upper Richibucto Formation. Spore determinations reveal that the Memramcook Formation ranges from latest Devonian to earliest Mississippian, the Boss Point from Namurian to Westphalian B age, the Salisbury from Westphalian C to Stephanian age, and the Richibucto from Westphalian D to Stephanian age. The spore samples identified are given in an appendix.—*from* Author's abstract

Carr, P. A. *See* Hobson, George D. 06939

00792 **Carroll, Roderick D.; Lee, Fitzhugh T.; Scott, James G.; Robinson, Charles S.** Seismic-refraction studies of the Loveland Basin landslide, Colorado, *in* Geological Survey research 1968, Chap. B: U.S. Geol. Survey Prof. Paper 600-B, p. B83-B87, illus., 1968.

A landslide which developed as a consequence of undercutting along Interstate Route 70 in Colorado was investigated using seismic-refraction methods. The thickness of a low-seismic-velocity layer (1,000 to 2,700 ft/sec), attributed to material involved in movement, was delineated. Bedrock material exhibited seismic

velocities ranging from 3,000 to 6,500 ft/sec. Interpretation of the results obtained along a number of lines was difficult, owing to severe energy attenuation and complex arrivals. Consequently the determination of the depth to the slide surface, based solely on seismic-refraction results, was uncertain. However, by combining the seismic results with results of other methods the degree of confidence in the final slide geometry that was derived was greatly increased.—Authors' abstract

06890 **Carss, Brian W.** In search of geological cycles using a technique from communications theory, *in* Computer applications in the earth sciences—Colloquium on time-series analysis: Kansas Geol. Survey Computer Contr. 18, p. 51–56, illus., tables, 1967.

Any Gaussian random time series can be specified by numbers of finite accuracy from which a normalized autocorrelation function may be calculated; with less accurate numbers a longer series is required. Frequency information derived from the power-density spectrum is of special interest in study of cyclic depositional environments. Recorded occurrences leave no doubt of the existence of many cyclic phenomena, but little is known about mechanisms that cause them. The technique is described for quantizing interpretation of an alternating Carboniferous time sequence, as an example. Curves (Heath, 1965 and Lumsden, 1965), to show limestone microfacies of the Bird Spring Group in Nevada, were quantized. With such a technique, more data will be accumulated from which better understanding may result.—GDC

01090 **Carter, Neville L.** Meteorite impact and deformation of quartz: Science, v. 160, no. 3827, p. 526–528, illus., 1968.

Quartz deformation lamellae parallel to c[0001] and planar features parallel to w[1013] appear to be both characteristic of and reliable criteria for quartz deformed by shock due to impact by meteorite or comet. These features are readily distinguished from microstructures, induced during tectonic deformation, by differences in optical properties or spatial and crystallographic orientations of statistically sound populations, or in both.—Author's abstract

00913 **Carver, Robert E.** Differential compaction as a cause of regional contemporaneous faults: Am. Assoc. Petroleum Geologists Bull., v. 52, no. 3, p. 414–419, illus., 1968.

A model was constructed to test the hypothesis that differential compaction could cause faulting in unconsolidated sediment. Mud volcanoes were produced during uniform, passive compaction, and faults were produced during forced, differential compaction of clay-water suspensions. Stress analysis indicates that the faults are simple shear failures. The stress field is approximately that of a point-supported beam with distributed loads along part of the length. Differential compaction faults may occur wherever large changes in total compaction of adjacent sediment masses occur, either as a result of change in thickness or of facies change. In the Gulf Coast area they occur on the inshore side of flexures, where both thickening and change from sand to clay facies occur in the offshore direction.—*from* Author's abstract

06920 **Cazeau, Charles J.** Geology and mineral resources of Oconee County, South Carolina: South Carolina Div. Geology Bull. 34, 38 p., illus., tables, geol. map, 1967.

Oconee County contains five major rock zones striking northeast and dipping southeast; from northwest to southeast, they are: mica gneiss, Brevard schist, augen gneiss, hornblende gneiss injection zone, and biotite gneiss, all metasedimentary. These are intruded by meta-igneous rocks such as the Westminster pluton, which has metasomatized peripheral areas into granitoid rocks. Evidence from the Brevard belt supports the view that it marks a fault zone. The geologic history is reviewed briefly. Chief potential mineral resources are granite gneiss, mica, marble, clay, and sand. [Appendix A has seven drill-hole logs from the Poor Mtn. area; a map showing marble outcrops and drill hole locations accompanies the report.]—*from* Author's abstract

Cesca, M. P. *See* Tandon, H. L. S. 00900

00822 **Chamberlain, Theodore.** The littoral sand budget, Hawaiian Islands: Pacific Sci., v. 22, no. 2, p. 161–183, illus., tables, 1968.

From profiles made across 80 selected Hawaiian beach areas at quarterly intervals for a year and a half, and 70 additional beaches measured less frequently, supplemented by water-jet borings and airphoto measurements, the total sand volume of each of the major Hawaiian beach systems was computed and their seasonal variations related to wave and littoral current regimes. About 4.0×10^7 cu yd of beach sand are held on the seven major islands, most of it concentrated on Kauai and Oahu, with the smallest amount on the island of Hawaii. Seasonal rates of erosion and accretion during 1962–63, per linear yard of beach per month, were generally a few tens of cubic yards; higher rates occurred on exposed north and west coasts, with a maximum of several hundred cu yd on Lumahai Beach, Kauai.—GDC

06786 **Chapman, Carleton A.** Magmatic central complexes and tectonic evolution of certain orogenic belts, *in* Étages tectoniques—Colloque de Neuchâtel, Neuchâtel Univ. Inst. Géol., 1966: Neuchâtel, Switzerland, La Baconnière, p. 41–51, illus., 1967.

The consistent alignment of central complexes and of individual plutons of the White Mountain magma series in New England suggests a large-scale structural control of intrusion phenomena. Fracture zones were formed at considerable depth within the Earth, and igneous activity was localized along their lines of intersection. Comparison of the British Tertiary and the Oslo (Norway) complexes with those of the northeastern USA reveals both similarities and some major structural and petrological differences. The contrasts are thought to reflect a general sequence of tectonic events that includes fracture or deformation in the upper mantle, local melting, and magmatic ascent by stoping and melting. Tectonic disturbance of crustal rocks during magmatic ascent is detrimental to the formation of central complexes.—JPF

00974 **Chari, Tuppal Ramanuja.** Information retrieval for soil engineers—Discussion [of paper 5471 by Am. Soc. Civil Engineers, 1967]: Am. Soc. Civil Engineers Proc., v. 94, paper 5922, Jour. Soil Mechanics and Found. Div., no. SM3, p. 807, 1968.

The writer believes that a proper abstract, brief and to the point, giving the technical contents of a paper and its conclusions, is most important. Key words are useful only in indexing and retrieval, and an author need not always prepare them (paper 5471, ibid., v. 93, no. SM5, pt. 2, 1967).—ESL

06941 **Charron, J. E.** Groundwater resources of Steinbach area, Manitoba (Townships 1 to 12, Ranges 6 to 11, east of principal meridian): Canada Geol. Survey Paper 66-6, 34 p., illus., tables, 1967.

This groundwater study of the Steinbach area, carried out during the summer of 1963, is the fifth on the hydrogeology of the Red River valley in Manitoba. Data on more than 2,600 wells were collected to be scrutinized for analysis. The study has shown that on the whole the area is a recharge area and that it has a good potable supply of hard water. It proves on the basis of topography, discharge zones, and the hydrochemistry of the groundwater, that in general, the groundwater movement is in a westward direction. It also establishes that flowing artesian zones "undermine" themselves. [Infiltration and hydrogeological maps of the area are in the pocket].—Author's abstract

06896 **Chenoweth, Philip A.** Southern Mid-Continent—Past, present, future: Oil and Gas Jour., v. 65, no. 49, p. 130–136, illus., 1967.

This is a reconstruction of the Late Cambrian and Early Ordovician history of the southern part of the Mid-Continent and an assessment of the future oil possibilities. Rocks of this age crop out in the Ozark uplift of southeast Missouri and in the mountains of southern Oklahoma. Elsewhere they are deeply buried, and in some very large parts of the region they have never been drilled. Consequently, this

reconstruction is largely deductive and generalized. Correlation of surface and subsurface sections poses major problems. Most of these rocks are lithologically similar dolomites and limestones with only minor amounts of sandstone and shale.—*from* Author's introduction

Clark, Allen L. *See* Hawley, C. C. 01140

06802 **Clark, George Michael.** Structural geomorphology of a portion of the Wills Mountain anticlinorium, West Virginia [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 6, p. 2477B, 1967.

01144 **Clark, John.** Cymaprimadontidae, a new family of insectivores: Fieldiana Geology, v. 16, no. 8, p. 241–254, illus., table, 1968.

The new family Cymaprimadontidae is based on two specimens: *Cymaprimadon kenni*, n.gen., n.sp., from Crazy Johnson Member of Chadron Formation, lower Oligocene, Pennington County, S. Dak., a right mandibular ramus with M_3 and most of an enlarged incisor; and a newly described but unnamed genus collected in 1894 from the Oligocene of "White River Badlands, S. Dak.," probably Scenic Member of Brule Formation, a part of a ramus with only M_3 preserved. The specialized incisor is interpreted as a fang forming the right half of a tube for injecting venom; the cheek-tooth dentition, massive musculature, and large size indicate an active, otter-size carnivore. Anatomy of the mandibular canal suggests close relationship with Pantolestidae and more distant relationship with Solenodontidae.—VMJ

Clarke, W. J. *See* Eames, F. E. 01042

01150 **Cleary, William J.; Pilkey, Orrin H.** Sedimentation in Onslow Bay, *in* Guidebook for field excursions, Geol. Soc. America, Southeastern Sec., Durham, N. C., April 1968: Southeastern Geology Spec. Pub. 1, p. 1–17, illus., 1968.

There are no rivers emptying into Onslow Bay and sediment exchange with adjacent bays is limited; the sediment cover is thin, and Tertiary outcrops are frequent. The sediments are primarily relict or residual and the nearshore Recent sediment band is essentially absent. The areal distribution of sediment textural and mineralogical characteristics is patchy. Outer shelf sediments are highly calcareous and algal; inner shelf sediments are less calcareous but contain fragmental mollusk remains. A relict nearshore fauna is present over much of the central shelf. Most of the sediments come from the Piedmont. The fine material is restricted to a nearshore band and a few miles wide and beyond the shelf break.—*from* Authors' abstract

01091 **Clemens, William A.** Origin and early evolution of marsupials: Evolution, v. 22, no. 1, p. 1–18, illus., 1968.

Origin and evolution of marsupials is interpreted from fragmentary fossil material, mostly teeth. Marsupialia became differentiated from Eutheria (placental mammals) in the early Late Cretaceous, both having evolved from a common eupantotherian stock. Differentiation was followed by a major adaptive radiation, first of marsupials, later of placentals, in North America. At the close of the Cretaceous all marsupial lineages except the didelphids became extinct; *Alphadon*, or other didelphids with similar dentition, successfully colonized South America and Australia in the Late Cretaceous or early Cenozoic; western Europe was colonized in early Eocene by a later wave of mammals from North America, including didelphid *Peratherium*, a descendant of *Alphadon*.—VMJ

00920 **Cloos, Ernst.** Experimental analysis of Gulf Coast fracture patterns: Am. Assoc. Petroleum Geologists Bull., v. 52, no. 3, p. 420–444, illus., 1968.

Gulf Coast faults are normal faults with the exception of those around fault domes. The accumulation of all horizontal components of these faults in the Gulf Coast embayment makes considerable horizontal displacement of the sedimentary blanket necessary. The regional Gulf Coast fault pattern and its many local variations are therefore thought to be caused by regional gravity creep of the sedimentary blanket

into the basin. As creep takes place the sliding sediments break away from the stationary ones forming a marginal graben, and, nearer the coast, asymmetrical down-to-basin faults with reverse drag, and antithetic faults.—*from* Author's abstract

Clough, G. Wayne. *See* Vesić, Aleksandar S. 00973

00782 **Coats, R. R.** Recent fault scarps in Independence Valley near Tuscarora, Elko County, Nevada, *in* Geological Survey research 1968, Chap. B: U.S. Geol. Survey Prof. Paper 600-B, p. B140-B143, illus., 1968.

In Independence Valley, near Tuscarora, Elko County, Nev., a system of northeast-trending faults cuts a late Quaternary gravel that veneers pediment surfaces cut on volcanic rocks of probable mid-Tertiary age. Some faults show erosionally degraded fault scarps up to 12 feet in height; the direction in which scarps face and the inferred direction of downthrow on the faults may be northwest or southeast, but most show the valleyward side downthrown. The faults are believed to be several hundred to several thousand years old. They have possible economic significance in prospecting for extensions of the gold-silver deposits of Tuscarora, or in the working of low-grade placers believed to exist in this district.—Author's abstract

00732 **Coffin, Donald L.** Relation of channel width to vertical permeability of streambed, Big Sandy Creek, Colorado, *in* Geological Survey research 1968, Chap. B: U.S. Geol. Survey Prof. Paper 600-B, p. B215-B218, illus., 1968.

The upper 38 miles of Big Sandy Creek is mostly perennial, and the lower 140 miles mostly ephemeral. The channel widens downstream through the upper reach and narrows downstream through the lower. As the decrease in channel width in the lower reach is the result of adjustment to long-term downstream decrease in flood discharge, the rate of decrease in channel width between any two points along the channel affords a basis for estimation of the average vertical permeability of the streambed between those two points. The estimated values of vertical permeability may be used for computation of water losses from the stream to the valley-fill alluvium.—Author's abstract

Cohen, Lewis H. *See* Klement, William, Jr. 01129

01099 **Colton, Roger B.** Surficial geologic map of the West Torrington quadrangle, Litchfield County, Connecticut: U.S. Geol. Survey Geol. Quad. Map GQ-727, scale 1:24,000, separate text, 1968.

Most surficial deposits in the West Torrington quadrangle are till, erratics, and ice-contact stratified deposits of the Pleistocene glaciation. Latest of the two glaciations in Connecticut was probably Wisconsin in age; trend in striae and grooves indicates the ice moved south-southeast. During deglaciation large masses of stagnant ice occupied positions now indicated by swamp deposits. Glacial melt-water streams eroded numerous ice-marginal channels in till and bedrock and redeposited materials as ice-contact stratified drift. Postglacial deposits include swamp and eolian deposits, alluvium, landslide deposits, and artificial fill. Most valuable natural resources are sand and gravel, but most pits have been exploited and some are nearly depleted.—MCM

00922 **Conrad, Eric H.** The precipitation of metastable carbonate minerals at low temperature and pressure: Southeastern Geology, v. 9, no. 1, p. 1-7, illus., 1968.

Three minerals (low magnesium calcite, high magnesium calcite, and aragonite) that occur in areas of modern carbonate deposition were precipitated at low temperature and pressure by the addition of mixtures of calcium ions and magnesium ions to sodium carbonate solutions under conditions of controlled temperature and digestion. The magnesium-calcium ion ratio controls the crystalline phase produced under these experimental conditions with four separate precipitation fields being present. General formation relations among these three phases are defined, based

on the effect of the magnesium-calcium ion ratio on the crystalline phase precipitated.—Author's abstract

00831 **Cook, Douglas R.** Suggestions for increasing metalliferous ore discoveries by more effective use of exploration techniques and other considerations [abs.]: Econ. Geology, v. 63, no. 1, p. 90, 1968.

00938 **Coppens, P.** The elimination of multiple reflection on the four-circle diffractometer: Acta Cryst., v. A24, pt. 2, p. 253–257, illus., table, 1968.

A procedure is described for the elimination of errors in observed intensities caused by multiple Bragg scattering. The necessary calculations can be done with an on-line computer, or after data have been collected. Experimental evidence supporting the proposed procedure is presented.—Author's abstract

06929 **Copper, Paul.** Adaptations and life habits of Devonian atrypid brachiopods: Palaeogeography, Palaeoclimatology, Palaeoecology, v. 3, no. 3, p. 363–379, illus., 1967.

Atrypid brachiopods, which are shallow marine benthos, anchored, stabilized or affixed themselves to the muddy substrate or to host objects on the sea floor by several alternative means: a well-developed pedicle muscle, frilly or spinous projections on the shell surface or modifications of shell shape. Atrypid taxa may show different, but functionally comparable adaptations to the same restricted environment, or show identical specialization of one character in the same biotope. Most, if not all sedentary atrypid species appear to have been oriented in a brachial valve upwards position in mature stages of growth.—Author's abstract

00928 **Cordell, Robert J.** Future of geology in petroleum exploration: Am. Assoc. Petroleum Geologists Bull., v. 52, no. 3, p. 475–487, 1968.

To be adequate, future geological contribution must be revamped to emphasize the following: (1) detailed natural stratigraphic correlations; (2) paleogeographic setting and its changes with time; (3) environmental and facies patterns; and (4) tectonic history. Techniques are suggested to improve quality of rock cuttings in future drilling, and to improve accessibility and storage of samples. A proposal for organizing petroleum exploration into three stages is presented, which coordinates geologists, geophysicists and research specialists.—WCC

06778 **Cornwall, Ian W.** Man in his environment, *in* Life, land and water—Conference on environmental studies of the Glacial Lake Agassiz region, 1966, Proc.: Manitoba Univ. Dept. Anthropology Occasional Paper 1, p. 13–24, 1967.

Man is notorious for alteration of his environment, and the areas where Man has lived the longest are the farthest from their original state; examples of comparison between Canada and Europe are cited. A general exhortation for concern with the geography behind history as well as the history behind geography is offered; Zeuner, of London, was one of the chief proponents of these concepts. The various interrelationships between biology, archeology, and geology are cited in evaluating environments.—HRC

Corre, H. A. *See* Kusler, David J. 01151

01009 **Cowen, R.** A new type of delthyrial cover in the Devonian brachiopod *Mucrospirifer*: Palaeontology, v. 11, no. 2, p. 317–327, illus., 1968.

A new type of delthyrial cover, *stegidial plates*, is described from very well-preserved specimens of *Mucrospirifer mucronatus* (Conrad) from the Traverse Group (Middle Devonian) of Michigan. Stegidial plates are unlike other delthyrial covers, such as deltidial plates and pleudodeltidia, because they are not integral parts of either valve; they are truly independent plates. As such, they can be compared only with the stegidium of some Upper Devonian spiriferides. The stegidium is re-interpreted in the light of its probable homology with stegidial plates; stegidial structures as a whole are regarded as unique within the phylum.—Author's abstract

00979 **Cox, Allan.** Lengths of geomagnetic polarity intervals: Jour. Geophys. Research, v. 73, no. 10, p. 3247–3260, illus., tables, 1968.

Variations in lengths of geomagnetic polarity intervals are analyzed by means of a probability model. Polarity reversals are assumed to occur as a result of interaction between steady oscillations of the geomagnetic dipole and secular variations of the nondipole field. The particular cycle on which a polarity inversion occurs is determined by magnitude of the nondipole field, assumed to vary randomly and independently of dipole variation. The reversal properties of the geomagnetic dynamo are characterized by the single parameter p, the probability that a polarity inversion will occur during one cycle of change in the geomagnetic dipole moment. From polarity changes during the past 10 m.y., the value of p is estimated to be 0.05. During the Permian, it was at least two orders of magnitude smaller. The analysis suggests that within the past 10 m.y. there have occurred short geomagnetic polarity events with durations shorter than 0.05 m.y.—*from* Author's abstract

06797 **Cox, Hollace Lawton, Jr.** An electron diffraction study of helium, neon, argon, krypton, and xenon [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 6, p. 2368B, 1967.

01120 **Crane, H. R.; Griffin, James B.** University of Michigan radiocarbon dates XII: Radiocarbon, v. 10, no. 1, p. 61–114, 1968.

The list of dates obtained since the compilation of List XI in December 1965 includes geologic samples from Pennsylvania, Alberta, Michigan, West Virginia, Alaska, Antarctica, and archeologic samples from the upper Mississippi Valley and Great Lakes, Florida, the United States Great Plains, northeastern United States and Canada, western United States, Mexico, Central and South America, Africa, Europe, Siberia, and Asia.—MCM

00785 **Croft, M. G.** Geology and radiocarbon ages of late Pleistocene lacustrine clay deposits, southern part of San Joaquin Valley, California, *in* Geological Survey research 1968, Chap. B: U.S. Geol. Survey Prof. Paper 600-B, p. B151–B156, illus., table, 1968.

Five radiocarbon dates from the southern San Joaquin Valley, Calif., indicate that large lakes, which existed in the valley during late Pleistocene time, may be synchronous with similar lake deposits in the Great Basin physiographic province. Radiocarbon ages were determined from wood fragments obtained from test holes drilled during hydrologic investigations. A radiocarbon date of 26,780±600 yr B.P. (before present, 1950) was obtained from wood collected about 3 feet beneath a lacustrine clay deposit that underlies the dry bed of Tulare Lake. Wood obtained from sand overlying the lacustrine clay was determined to have a radiocarbon age of 13,350±500 yr and that obtained from sand beds that interfinger with a lacustrine clay deposit beneath the dry bed of Buena Vista and Kern Lakes an age of 9,040±300 yr.—Author's abstract

06935 **Cuffey, Roger J.** Bryozoan *Tabulipora carbonaria* in Wreford megacyclothem (Lower Permian) of Kansas: Kansas Univ. Paleont. Contr. [43], Bryozoa, art. 1, p. 1–95, illus., tables, 1967.

Tabulipora carbonaria is composed of robust, branching, sheetlike forms of trepostomes; it probably evolved from the Late Mississippian *T. cestriensis–T. ramosa* complex. Taxonomy, including application of biologic species concepts and selection of lectotypes, and morphology of *T. carbonaria*, are discussed extensively. The species is morphologically highly variable, especially the diaphragms and wall types, which are considered by previous workers as taxonomic differences. The life history of the individual zooaria is discussed; most were a few months to a few years old. Some display progressive geographic variations across Kansas, and others show microevolutionary variations within the cyclothem. The concept of "success number" is described. Its ecology is discussed also.—*from* Author's abstract

01143 **Curtin, Gary C.; Lakin, Hubert W.; Neuerburg, George J.; Hubert, Arthur E.** Utilization of humus-rich forest soil (mull) in geochemical exploration for gold: U.S. Geol. Survey Circ. 562, 11 p., illus., 1968.

Distribution of gold in humus-rich forest soil (mull) reflects the known distribution of gold deposits in bedrock in the Empire district, Colorado. Gold from the bedrock is accumulated by pine and aspen trees and is concentrated in the mull by the decay of organic litter from the trees. Anomalies in mull which do not coincide with known gold deposits merit further exploration. The gold anomalies in soil (6- to 12-inch depth) and in float pebbles and cobbles poorly reflect the known distribution of gold deposits in bedrock beneath the extensive cover of colluvium and glacial drift.—Authors' abstract

06924 **Cushing, E. J.; Wright, H. E., Jr.** (editors). Quaternary paleoecology—Internat. Assoc. Quaternary Research, 7th Cong., 1965, Proc., V. 7: New Haven, Conn., Yale Univ. Press, 433 p., illus., tables, 1967.

This is in part a symposium on the relations of the late-Wisconsin vegetational history to the glacial sequence in the Great Lakes region, but also includes regional studies as far west as California. There are 23 articles (cited individually) in three general categories: methodology, regional studies, and climatic history.—HRC

06900 **Cushing, Edward J.** Late-Wisconsin pollen stratigraphy and the glacial sequence in Minnesota, *in* Quaternary paleoecology—Internat. Assoc. Quaternary Research, 7th Cong., 1965, Proc., V. 7: New Haven, Conn., Yale Univ. Press, p. 59-88, illus., tables, 1967.

Pollen evidence does not show a close correlation between vegetation succession and climatic change accompanying glacial activity in the 15- to 10,000 year interval. Four glacial lobes in the State did not reach maximum or equilibrium at the same time. The complexity of the pollen flora and the lack of close modern analogs make interpretation uncertain. A simple hypothesis, however, is that late-Wisconsin vegetation changed in response to a progressive increase in temperature with no reversals in that trend. Over 40 radiocarbon dates are known, but are still insufficient to permit the correlation of glacial and pollen stratigraphy. Neither the Nickerson Phase nor the Valders readvance is represented by climatic oscillations interpretable from pollen diagrams that span the same time interval.—*from* Author's abstract

06824 **Cvancara, Alan M.** Mussels of the Red River Valley in North Dakota and Minnesota and their use in deciphering drainage history, *in* Life, land and water—Conference on environmental studies of the Glacial Lake Agassiz region, 1966, Proc.: Manitoba Univ. Dept. Anthropology Occasional Paper 1, p. 187-196, illus., tables, 1967.

Thirteen species of mussels are known to live in the rivers of the Red River valley of North Dakota and Minnesota. High chloride content, long periods of no flow, pollution, and possibly turbidity are considered to be the most significant factors limiting present mussel distribution in the valley. By applying these factors to past times, mussels may be useful as aids in deciphering Red River valley drainage history.—Author's summary

01035 **Dane, Carle H.; Kauffman, Erle G.; Cobban, William A.** Semilla Sandstone, a new member of the Mancos Shale in the southeastern part of the San Juan Basin, New Mexico: U.S. Geol. Survey Bull. 1254-F, p. F1-F21, illus., 1968.

A sandstone member in the lower part of the Mancos Shale, a few feet below the Juana Lopez Member, is named from outcrops along the west side of the valley of Arroyo Semilla. The type section is near Holy Ghost Spring about 7 1/2 miles south of La Ventana in the northwestern part of Sandoval County, N. Mex. The member is composed of very well sorted, fine- to medium-grained sandstone, nowhere more than 70 feet thick, with several persistent zones of calcareous concretions. It contains a marine molluscan fauna characteristic of the *Prionocyclus hyatti* zone of middle Turonian age that in the upper part is closely comparable with that of the Codell Sandstone Member of the Carlile Shale of Kansas.—CHD

00923 **Daniels, R. B.; Young, Keith K.** Loess in southcentral Louisiana: Southeastern Geology, v. 9, no. 1, p. 9–19, illus., 1968.

A band of silty material 10 to 25 miles wide overlies the Prairie Formation west of the Mississippi River in southcentral Louisiana. The massive unstratified silt buries soils at the top of the Prairie and the Montgomery Formations. It mantles the meander scar topography south of the Vermilion River and the salt domes at Avery Island and Weeks Island. The silt is thickest at the Prairie–Mississippi alluvial valley scarp and thins to the west as a function of distance from the scarp. The properties and distribution of the silt indicate it is an eolian deposit.—Authors' abstract

Darnell, Richard P. *See* Meeves, Henry C. 01156

01082 **Darnley, A. G.** Helicopter tests with a gamma-ray spectrometer: Canadian Mining Jour., v. 89, no. 4, p. 104–106, illus., 1968.

Many rock types, and rocks of different ages, will yield characteristic spectral "signatures" that will enable them to be traced across country from the air by gamma-ray spectroscopy.—ARK

00937 **Darrah, Elsie Louise.** The microstructure of some Pennsylvanian seeds and megaspores studied by maceration: Micropaleontology, v. 14, no. 1, p. 97–104, illus., tables, 1968.

A study of Pennsylvanian petrified seeds and seedlike megaspores has revealed new information on the structure of the megaspore membrane and associated tissues, and has provided characteristics useful for identifying seed fragments released from coals and shales by maceration. Layering and ornamentation may be observed in surface views of detached megaspore membranes, but clarity is greater if microtome sections are prepared. Fragments of the nucellus which sometimes remain associated with the megaspore membranes supplement these features and aid in the recognition of taxa. Genera studied which are recognizable from fragments of megaspore membrane are: *Cardiocarpus, Conostoma, Codonospermum, Stephanospermum, Taxospermum, Pachytesta, Lepidocarpon,* and *Lepidostrobus.—from* Author's abstract

00849 **Davidson, Anthony.** Metamorphism and intrusion in the Benjamin Lake map-area, Northwest Territories [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 7, p. 2899B, 1968.

01060 **Davies, J. C.** Kenora District, *in* Annual report of Resident Geologists' Section, Geological Branch, 1967, Pt. 1: Ontario Dept. Mines Misc. Paper 16, p. xi–xiii, 1–20, illus., 1968.

Descriptions of five properties visited by the Resident Geologist are included, three were sulfide and two uranium. Principal exploration activities in each mining division are listed. Exploration for base metals is expected to continue about the same, but increased activity for uranium may result from discoveries along a belt from the Kenora area to the Sioux Lookout area.—ESL

06856 **Davis, John C.** Absence of detectable trends in the rate of bentonite occurrences in the Mowry Shale (Cretaceous) of Wyoming, *in* Computer applications in the earth scieces—Colloquium on time-series analysis: Kansas Geol. Survey Computer Contr. 18, p. 73–75, illus., table, 1967.

A petrographic investigation of a Cretaceous black shale (Davis, 1967) provided an opportunity to test time-series analysis. The siliceous Mowry Shale, deposited in as uniform marine situation as can be found, has, in the section near Sand Draw, Fremont County, Wyo., thick bentonites easy to find for testing trends. Calculating their fit to the Poisson distribution, model assumptions are confounded by randomly spaced eruptions, changes in sedimentary rates, and fluctuations in sedimentation. In other tests for frequency pattern, functions were not significantly different. It is concluded that thickness measurements in this or any other section of Mowry Shale can give no significant data on rates of volcanic eruptions.—GDC

06933 **Davis, John C.; Sampson, Robert J.** FORTRAN II time-trend package for the IBM 1620 computer: Kansas Geol. Survey Computer Contr. 19, 28 p., tables, 1967.

Many types of geologic data are distributed serially, either through time or along a geographic coordinate, and are seldom equally spaced, especially in the time sense. Uniformly ordered information includes varved sequences and annual growth of organisms; other types, such as measurements of a stratigraphic succession, represent a nonuniform time series. Serial methods have been applied to three types of investigation: extraction of components, examination for periodicity, and obtaining numerical approximations of sequences. Filtering of seismograph records and detecting long-term trends from stratigraphic sequences are examples of these applications. The purpose of the package of programs given is to compute cross- and autocorrelations, cross-difference products, or cross associations between chains of numeric data. Chains containing up to 350 points may be used.—ESL

06925 **Davis, Margaret B.** Late-glacial climate in northern United States—A comparison of New England and the Great Lakes region, *in* Quaternary paleoecology—Internat. Assoc. Quaternary Research, 7th Cong., 1965, Proc., V. 7: New Haven, Conn., Yale Univ. Press, p. 11–43, illus., tables, 1967.

Pollen assemblages in surface sediments from northern Canada display geographical correlations with modern vegetation. Boreal, mixed, and deciduous forest regions are clearly identifiable, as is tundra. Tundra occurred in southern New England until about 12,000 years ago. An open spruce woodland appeared about 10,500 years B.P. There is no climatic warming trend at this time. In Nova Scotia, a late-glacial pollen sequence resembles modern Labrador. In the Great Lakes region, a narrow tundra belt was succeeded by woodland, and then by forest. At the end of late-glacial time (10,000 years B.P.), forest developed in New England similar to that in modern Ontario, and that in Minnesota resembled that in modern Manitoba. The climate was cold and continental without a clear temperature oscillation similar to Europe at this time.—*from* Author's abstract

06910 **Davis, Ronald B.** Pollen studies of near-surface sediments in Maine lakes, *in* Quaternary paleoecology—Internat. Assoc. Quaternary Research, 7th Cong., 1965, Proc., V. 7: New Haven, Conn., Yale Univ. Press, p. 143–173, illus., tables, 1967.

Cores and mud sections from the upper 80 cm of sediment in an oligotropic, a dystrophic, and two eutropic lakes were studied. Pollen and charcoal profiles were prepared and compared with known historical changes in the region. Sedimentation rates of 1.8 to 2.2 cm per yr are calculated. Pollen profiles do not reflect fires, but charcoal profiles do. The relation of burrowing metazoans to the sediments is shown also; the density of burrows decreases with depth below 4 cm. A theoretical model is developed to illustrate profile changes brought about by mixing of sediments by benthos.—*from* Author's abstract

Deacon, Robert J. *See* Schlicker, Herbert G. 06936

Dearien, J. A. *See* Wolleben, J. A. 01045

01167 **DeBoer, Jelle.** Paleomagnetic differentiation and correlation of the Late Triassic volcanic rocks in the central Appalachians (with special reference to the Connecticut Valley): Geol. Soc. America Bull., v. 79, no. 5, p. 609–626, illus., tables, 1968.

In Connecticut four periods of Late Triassic–Early Jurassic volcanic activity show progressively higher positive inclination of thermoremanent directions of magnetization with decreasing age. Correlations with paleomagnetic data from Triassic volcanic rocks in Pennsylvania and Nova Scotia suggest northeastward displacement of volcanic activity in Late Triassic time. The magnetic pole shift is related to a high order reversal of the magnetic field and separates the Permian positive magnetic era from the Cretaceous negative magnetic era.—AG

01123 **Dellwig, Louis F.** Significant features of deposition in the Hutchinson salt, Kansas, and their interpretation, *in* Saline deposits—Internat. Conf. Saline Deposits, Houston, Tex., 1962, Symposium: Geol. Soc. America Spec. Paper 88, p. 421–426, illus., 1968.

Variations in salt-grain size, structure, and distribution; banding; insoluble composition and distribution; hydrocarbon content; and primary structures are significant in the interpretation of the environment of salt deposition. In the Hutchinson salt (Permian) of Kansas, ripple marks, large-scale polygons, minor unconformities, and composition indicate deposition in a basin of shallow depth with periodic subaerial exposure of at least the marginal portions of the basin.—Author's abstract

01016 **DeMille, George; Shouldice, J. R.** Saline deposits of Alberta and Saskatchewan [abs.], *in* Saline deposits—Internat. Conf. Saline Deposits, Houston, Tex., 1962, Symposium: Geol. Soc. America Spec. Paper 88, p. 408–409, 1968.

00819 **Dennis, John V.** Limestone conglomerate formations of Maryland and northern Virginia: Atlantic Naturalist, v. 23, no. 1, p. 14–18, illus., 1968.

The limestone conglomerate of Maryland and northern Virginia is a mixture of large, coarsely rounded fragments of varied composition set in a fine grained matrix. The dominant material of both the matrix and the larger fragments is limestone. The rock formed by the cementing of grâvels deposited in stream beds. Fossils of fresh-water fish and dinosaur foot prints found closely associated with the conglomerate indicate an upper Triassic age.—KAS

00738 **Denny, Charles S.; Goodlett, John C.** Tree-throw origin of patterned ground on beaches of the ancient Champlain Sea near Plattsburgh, New York, *in* Geological Survey research 1968, Chap. B: U.S. Geol. Survey Prof. Paper 600-B, p. B157-B164, illus., 1968.

Patterns of stones and finer materials on beaches of the ancient Champlain Sea near the northeast end of the Adirondack Mountains, N.Y., look like sorted circles produced by repeated freeze and thaw and suggest that frost action was vigorous on the shores of the Champlain Sea about 11,000 years ago. These patterns, however, are only a few hundred years old. They are due to the formation and erosion of mounds and pits produced by the toppling of trees during the last few centuries. Whatever patterns may have been on the surface of these beaches during Champlain Sea time have been completely destroyed by the uprooting of trees since the beaches were first invaded by forest.—Authors' abstract

06859 **Depatie, Jean.** Geology of L'Ours Lake area, Duplessis county [also French edition]: Quebec Dept. Nat. Resources Prelim. Rept. 559, 13 p., table, geol. map, 1967.

The L'Ours Lake area is a peneplane cut by narrow V-shaped valleys, except for the Romaine River, which flows in a wide, swampy U-shaped valley; marine terraces are found along the St. Lawrence. Ordovician rocks occur along the St. Lawrence, but other consolidated rocks are Precambrian metasediments and intrusives. Folds, faults, and shear zones are described. The structure in the east half is complicated by intrusions. Ilmenite is disseminated in all the igneous rocks, with veins up to two inches wide in fractures. Several hundred samples of stream sediment were tested for Cu, Zn, Pb, and Mo; concentrations are shown on the accompanying geologic map.—ESL

Dessau, G. *See* Jensen, M. L. 06872

deVries, P. H. *See* Geiger, K. W. 00821

01046 **Dickey, Parke A.** Geological significance of abnormal pressures in deep oil and gas wells [abs.]: Houston Geol. Soc. Bull., v. 10, no. 8, p. 5, 1968; South Texas Geol. Soc. Bull., v. 8, no. 4, p. 1, 1968.

01089 **Dickey, Parke A.; Shriram, Calcutta R.; Paine, William R.** Abnormal pressures in deep wells of southwestern Louisiana: Science, v. 160, no. 3828, p. 609–615, illus., table, 1968.

The complex down-to-the-basin growth faults of southern Louisiana appear to have been caused by slumping along the edge of the continental shelf during

sedimentation. The toes of the slides must resemble low-angle overthrusts, with repetition of the section. The growth faults seal the flow of fluids, and downdip from them abnormally high pressures are found. The shales in these intervals are less compacted than is usual at the depth at which they are buried. The normal processes of compaction and diagenesis were arrested by the faulting. The pore water has remained in the sediments, where it supports part of the weight of the overburden and its hydrostatic pressure is much above normal. The high pressures show that these shales have extremely low permeability.—KAS

06844 **Dionne, Jean-Claude.** Formes de corrosion littorale, côte sud du Saint-Laurent [with English abs.]: Cahiers Géographie Québec, v. 11, no. 23, p. 379-395, illus., table, 1967.

Corrosion features were observed on the south shore of the maritime St. Lawrence estuary, in conglomerate, limestone, sandstone, shale, and crystalline boulders, and are here described for the first time. An attempt to classify these minor features characteristic of rocky shores is made and an extensive bibliography is given. An effort should be made to get more information on the geographical distribution of coastal corrosion forms on noncalcareous rocks in cold regions.—Author's English abstract

06845 **Dionne, Jean-Claude.** Modelé périglaciaire de la région de Mont-Joli, Québec: Cahiers Géographie Québec, v. 11, no. 23, p. 398-401, illus., 1967.

Small shale hills, formed in pre-Wisconsin time, have been altered by glacial action and by gelifluxion and solifluction since then. The low areas between the hills contain a greater thickness of debris than do the tops of the hills; solifluction brought the material downward. At first, the hills resemble moraines, but they have very individual appearances when compared with the surrounding material; the gentle slopes are very distinctive.—HRC

06914 **Dionne, Jean-Claude.** Pourcentages de matériaux cristallins dans les formations meubles détritiques de la région côtière Montmagny-La Pocatière [with English abs.]: Cahiers Géographie Québec, v. 11, no. 23, p. 411-418, illus., table, 1967.

The sediments of the detrital deposits in the Montmagny-La Pocatière are Appalachian in origin; gravel 2 to 10 cm from raised beaches and drift is 87 and 97 percent from Appalachian sources, respectively. Therefore, little came from the Laurentian Shield to the north. Only a low submerged valley separates the shield from the deposits so that the low proportion of shield material is difficult to understand. The submarine topography of the St. Lawrence Valley does not supply the answer as little or no material was trapped in it. Boulders found at the surface of post-glacial moraine surfaces (25 and 40 m shorelines) are 60 percent crystalline and are considered to be ice-rafted.—*from* Author's abstract

01107 **Dixon, H. Roberta.** Bedrock geologic map of the Danielson quadrangle, Windham County, Connecticut: U.S. Geol. Survey Geol. Quad. Map GQ-696, scale 1:24,000, section, 1968.

00797 **Dodge, F. C. W.; Moore, James G.** Occurrence and composition of biotites from the Cartridge Pass pluton of the Sierra Nevada batholith, California, *in* Geological Survey research 1968, Chap. B: U.S. Geol. Survey Prof. Paper 600-B, p. B6-B10, illus., tables, 1968.

Composition of analyzed biotites from the Cartridge Pass pluton, a zoned granitic intrusion of the Sierra Nevada batholith, shows little correlation with bulk rock composition. Systematic variations of minor elements suggest that the micas originally crystallized over a range of temperatures, but constant major-element composition suggests that all the biotites were equilibrated with respect to the same oxygen partial pressure. Buildup of fluid pressure late in the crystallization history of the pluton, and permeation of the entire pluton by a late H_2O-rich fluid of a specific oxygen partial pressure may be responsible for the homogeneity of major-element composition.—Authors' abstract

06803 **Donahue, Jack David.** Depositional environments of the Salem Limestone (Mississippian, Meramec) of south-central Indiana [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 6, p. 2477B–2478B, 1967.

Doner, H. E. *See* Eaton, Frank M. 01067

06942 **Donn, William L.** Causes of the ice ages: Sky and Telescope, v. 33, no. 4, p. 221–225, illus., table, 1967.

A theory of ice ages has been developed that explains the initial decline of temperature down to glacial level as the result of polar wandering. When the poles reached their present neighborhoods, a strongly zoned climate developed. Glacial–interglacial fluctuations are tied to the availability of moisture to start and nourish the continental ice. Evaporation from an ice-free Arctic Ocean would have provided the moisture to initiate and nourish an ice sheet. The ice sheet would finally cool both the air and surface of the adjoining seas until evaporation would be insufficient to sustain glaciation. Glacial and interglacial alternations will continue as long as the geographic poles remain in their current thermally isolated locations.—KAS

01008 **Donovan, J. F.** Geology of Halcrow-Ridout Lakes area, District of Sudbury: Ontario Dept. Mines Geol. Rept. 63, 45 p., illus., table, geol. maps, 1968.

In this Precambrian area of four townships, northwest of Sudbury, intercalated metavolcanic rocks trend east–west. Two major sedimentary belts, predominantly conglomerate and quartzite, form part of a doubly-plunging syncline, its north limb overturned; major faults occur along the Kinogama and Wakami Rivers. A western contact metamorphic zone is developed by intrusive granite. Diorite intrusions are closely associated with basic volcanic rocks; numerous later diabase dikes trend northwest and northeast in all other rock types. Mineralized quartz veins have been searched for gold but have yielded no commercial deposits. Among other possible resources, asbestos is reported for the first time. Pleistocene and Holocene deposits mantle much of the area. Two geologic maps, Halcrow–Denyes and Tooms–Greenlaw townships, are in pocket.—GDC

01057 **Donovan, J. F.** Sudbury District, *in* Annual report of Resident Geologists' Section, Geological Branch, 1967, Pt. 2: Ontario Dept. Mines Misc. Paper 17, p. 72–110, illus., tables, 1968.

Mining activity was at a high level in the Sudbury area, largely due to renewed interest in uranium, and major exploration by nickel companies. New publications, and assessment work maps and reports filed, are listed. Properties examined and described include: uranium in the Agnew Lake area and north of Capreol, an iron mine at Moose Mtn., and sulfides on the north shore of Raft Lake.—ESL

00869 **Dosso, Harry William.** Analytical and analogue methods of studying electromagnetic variations at the Earth's surface [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 7, p. 2909B–2910B, 1968.

Drees, L. R. *See* Wilding, L. P. 01063

Dreeszen, V. H. *See* Keech, C. F. 00910

00887 **Drnevich, Vincent Paul.** Effects of strain history on the dynamic properties of sand [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 7, p. 2830B, 1968.

01127 **Duchesne, J. C.** Dosage du Sr et Rb dans les feldspaths et roches acides par spectro-fluorescence X—Application à quelques roches standards [with English abs.]: Soc. Géol. Belgique Annales 1966–67, v. 90, Bull. 7, p. B657–B667, illus., tables, 1968.

G-1, S-1 and some samples (granites and feldspars) calibrated by isotope dilution are used as standards for the determination of Sr and Rb by X-ray emission spectroscopy. Matrix influence is corrected by considering the Ca-, K-, and Fe-contents of the sample. Analyses of rock reference samples GR, GA, GH (CRPG-

Nancy), G-2, GSP-1, AGV-1 (USGS-Washington), and Bureau of Standards 70 are reported.—Author's abstract

06804 **Duffy, Leo Joseph.** The chemistry of vitrinitic macerals from coals in bituminous range [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 6, p. 2478B, 1967.

Dunlap, John C. *See* Kozary, Myron T. 01037

Dunn, David E. *See* Butler, J. Robert. 01149

01153 **Dunton, Polly J.** Determination of total bromine in brines by x-ray fluorescence: Appl. Spectroscopy, v. 22, no. 2, p. 99-100, tables, 1968.

Total bromine in brines may be determined directly by X-ray fluorescence by measuring the peak-to-background intensity ratio of the bromine *K*-alpha radiation. The accuracy of the determination is unaffected by wide differences in the specific gravity of the brines. Bromine concentrations of 1 to 1,000 ppm may be determined in about one minute with an accuracy comparable to that of usual chemical methods.—Author's abstract

01081 **Dyck, Willy; Smith, A. Y.** Use of radon 222 in surface waters for uranium geochemical prospecting: Canadian Mining Jour., v. 89, no. 4, p. 100-103, illus., 1968.

This report gives radon-222 concentrations for 59 lakes and streams in the Bancroft area where economic uranium deposits occur. Widespread sampling reduces the size of the target area.—ARK

Dyer, H. B. *See* Hawley, C. C. 00941

01042 **Eames, F. E.; Clarke, W. J.; Banner, F. T.; Smout, A. H.; Blow, W. H.** Some larger foraminifera from the Tertiary of Central America: Palaeontology, v. 11, no. 2, p. 283-305, illus., 1968.

Some larger foraminifera are recorded from various localities in the Central American region, many of them being illustrated. Additional information concerning, and new illustrations of, topotype material of some previously known forms are given. New subgenera *Vlerkina* and *Vlerkinella* (of the genus *Heterostegina*) are proposed; four new species and one new subspecies are described and illustrated. Certain aspects of the stratigraphy of the region are discussed, and the genus *Pliolepidina* is acknowledged to range down to the late Eocene. The Oligocene age of certain occurrences of large foraminifera is confirmed by the associated planktonic foraminifera.—Authors' abstract

01105 **Eargle, D. Hoye.** Stratigraphy and structure of the Tatum salt dome area, southeastern Mississippi and northeastern Washington Parish, Louisiana, *in* Saline deposits—Internat. Conf. Saline Deposits, Houston, Tex., 1962, Symposium: Geol. Soc. America Spec. Paper 88, p. 381-405, illus., table, 1968.

Louann salt of Jurassic(?) age underlies 20,000 feet of Jurassic to Holocene sedimentary rocks. The nature of the rocks below the salt is unknown. Salt in the northern part of the area has formed diapirs, and various other structures have formed as a result of vertical salt movement outside of the area of shallow piercement domes. The Wiggins anticline area to the south, however, was not affected by the salt movement. Structure contour and isopach maps permit the interpretation of post-early Cretaceous events. The top of the Lower Cretaceous dips generally westward; Upper Cretaceous rocks dip southwest and thicken to the northeast. Miocene and younger rocks thicken and dip south-southwest. The structure of the older formations is more complex than that of the younger rocks.—HRC

01067 **Eaton, Frank M.; McLean, G. W.; Bredell, G. S.; Doner, H. E.** Significance of silica in the loss of magnesium from irrigation waters: Soil Sci., v. 105, no. 4, p. 260-280, illus., tables, 1968.

To the extent that Ca and Mg of irrigation waters are precipitated in soils with evapotranspiration, there are associated increases in Na percentages and alkalinity. There are also impairments in soil permeability. With deterioration in soil structure, aeration is retarded. Precipitation reactions of Mg with SiO_2 are stronger than reactions of Ca with SiO_2.—JWH

01162 **Eaton, W. L.; Gait, G. B.** Microfilming maps of abandoned anthracite mines, in the Wyoming Basin, northern anthracite field: U.S. Bur. Mines Inf. Circ. 8379, 13 p., illus., table, 1968.

This is the second in a series of reports on microfilming and cataloging maps of abandoned mines in the four anthracite fields of Pennsylvania. A catalog for the Wyoming Basin of the northern field is presented.—VPB

Ekren, E. B. *See* Rogers, C. L. 00825

Elliott, Raymond L. *See* Reed, Bruce L. 00931

06818 **Elson, John A.** Geology of Glacial Lake Agassiz, *in* Life, land and water—Conference on environmental studies of the Glacial Lake Agassiz region, 1966, Proc.: Manitoba Univ. Dept. Anthropology Occasional Paper 1, p. 37–96, illus., tables, 1967.

The topographic setting and deposits in the lake basin are outlined, and stratigraphic, radiocarbon, and geomorphic interpretations are presented. A hypothetical history of the lake, with four high-water stages and three low-water stages, is outlined. Details of position and continuity of water planes are uncertain; glacial readvance has destroyed much of the evidence. This four episode history is a substantial advance over the previously-held two phase lake.—*from* Author's conclusions

Elston, Donald P. *See* Shoemaker, Eugene M. 01021

00921 **Emery, K. O.** Relict sediments on continental shelves of world: Am. Assoc. Petroleum Geologists Bull., v. 52, no. 3, p. 445–464, illus., 1968.

The sediments deposited on the continental shelves during and immediately after the last Pleistocene glacial stage are unrelated to their present environments. The rise of sea level during the past 19,000 years has caused previously deposited subaerial, lacustrine, and paludal sediments to become deeply submerged in marine waters. Land-laid or shallow-marine sediments which occur in deep water, such as those near the seaward edge of the continental shelf, are properly termed "relict." The sediments exposed in about 70 percent of the area of the continental shelves of the world can be identified as relict. Eventually, new detrital sediments should prograde across the continental shelf and bury the relict sediments. This burial should be hastened if the rise of sea level remains as slow as it has been during the past few thousand years.—*from* Author's abstract

06848 **Emiliani, C.** In memoriam, Louis Lidz, 1939–1967: Sedimentology, v. 9, no. 3, p. 264, 1967.

Emiliani, Cesare. *See* Bolli, H. M. 01070

Empson, F. M. *See* Bradshaw, R. L. 01118

Engel, Celeste. *See* Lovering, T. S. 06921

00850 **Eppert, Herbert Charles, Jr.** The marine geology and ecology of an area off the west coast of Kauai, Hawaii [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 7, p. 2900B, 1968.

Erickson, Ralph L. *See* Wells, John D. 00839

06788 **Escher, A.** Tectonic levels in the Precambrian of south Greenland, *in* Étages tectoniques—Colloque de Neuchâtel, Neuchâtel Univ. Inst. Géol., 1966: Neuchâtel,

Switzerland, La Baconnière, p. 141–150, illus., 1967; reprinted as Grönlands Geol. Undersögelse Misc. Paper 55, 1967.

Precambrian rocks in the Ketilidian fold belt of southern Greenland have undergone four phases of deformation during which there existed varying degrees of repeated metamorphism and migmatization. Various tectonic levels show distinctly different styles of folding resulting from the same deformation. The low level is characterized by open similar folds, isoclinal recumbent folds with axial plane foliation occur at the intermediate level, and the high level shows mostly open concentric structures with numerous faults. The observations reveal a definite time/space relationship between tectonic style, migmatization, and metamorphism.—JPF

Farrand, W. R. *See* Kelley, R. W. 06930

06805 **Fauth, John Louis.** Geology of the Caledonia Park area, South Mountain, Pennsylvania [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 6, p. 2478B–2479B, 1967.

06948 **Feduccia, J. Alan.** A new swallow from the Fox Canyon local fauna (Upper Pliocene) of Kansas: Condor, v. 69, no. 5, p. 526–527, illus., 1967.

Many avian fossils from local faunas of the Rexroad Formation, Meade County, Kans., remain unreported. A humerus of *Hirundo aprica*, n. sp., from the Fox Canyon Locality, is here described. Hibbard previously included fossils from this locality in the Rexroad local fauna but now considers them to represent an older local fauna. The bird bone is compared with 20 extant species of 11 hirundinid genera and with the extinct *Tachycineta speleodytes* from the middle Pleistocene of Florida; it most closely resembles *Hirundo rustica*, the European barn swallow. The new species extends the record of Hirundinidae in North America back to upper Pliocene; three extant species also have fossil records in middle and late Pleistocene.—VMJ

00967 **Feige, Y.; Oltman, B. G.; Kastner, J.** Production rates of neutrons in soils due to natural radioactivity: Jour. Geophys. Research, v. 73, no. 10, p. 3135–3142, tables, 1968.

This paper provides quantitative data from experiments in which several compounds were exposed to monoenergetic helium ions with energies of 4.8 to 8.8 Mev. The experiments were conducted to estimate the neutron production rates from natural alpha emitters in typical sand, granite, and limestone. Assuming 3 ppm of U and 11 ppm of Th as representative of the upper crust, production rates of 6.7 ± 0.7 n per g per yr for sand and 13.5 ± 1.3 n per g per yr for granite I are calculated. An additional 1.4 n per g per yr are produced by spontaneous fission of 3 ppm of U–238. Of course the composition and the contents of U, Th, and their decay products may be significantly different for the upper layers of soil and underlying geologic structures. These (α,n) reactions may be of some interest to geologists; they may be the main contributors to neutron fluxes in tunnels, deep caves, and mines where cosmic ray background is low.—DBV

00729 **Feltis, R. D.** Preliminary assessment of ground water in the Green River Formation, Uinta Basin, Utah, *in* Geological Survey research 1968, Chap. B: U.S. Geol. Survey Prof. Paper 600–B, p. B200–B204, tables, geol. map, 1968.

The Green River Formation of Eocene age contains not only large reserves of hydrocarbons in the form of bituminous sand and oil shale but also aquifers that yield small to large quantities of water to wells and springs. Thus, sufficient water for processing the hydrocarbons may be locally available from subsurface sources. The ground water ranges from fresh to briny. Detailed hydrologic studies are needed to determine the quantity and quality of water in the formation.—Author's abstract

01048 **Ferguson, S. A.** Geology of the northern part of Heyson township, District of Kenora: Ontario Dept. Mines Geol. Rept. 56, 54 p., illus., tables, geol. map, 1968.

Some of the orebodies at Madsen, in the southern part of the Red Lake gold mining area, extend into Heyson township on the lower levels of the mine. The Precambrian rocks are metabasalt overlain by welded tuff, intrusives of several altered basic types, and granitic stock (chiefly Dome and Faulkenham Lake stocks), their contacts generally conformable with the curving strike of adjacent rocks. The Heyson syncline and associated anticlines trend northeast, persisting up to 5 mi in length; no faults were found by surface mapping. Gold was found mainly in small fractures and in sulfides within veins in a quartz latite bed of the welded tuff unit near the Dome stock boundary; at the Madsen mine orebodies are within the Austin tuff at the contact between metabasalt and welded tuff. Mineral associations and analyses of host rocks are given.—GDC

00954 **Fernandez, Luis M.; Careaga, Jose.** The thickness of the crust in central United States and La Paz, Bolivia, from the spectrum of longitudinal seismic waves: Seismol. Soc. America Bull., v. 58, no. 2, p. 711–741, illus., tables, 1968.

The ratio of vertical and horizontal components of the P-phase provides a crustal transfer function independent of the frequency content of the source and a function only of the angle of incidence of the rays and crustal parameters of the site where the observation is taken. This ratio corresponds to the tangent of the apparent angle of emergence and as such this apparent angle is a function of the frequency. Spectra of this type have been obtained in the central United States and in La Paz, Bolivia, for large magnitude teleseisms. The observed curves have been compared with theoretical universal curves corresponding to one- and two-layer models. Average results for several observations give a crustal thickness in the central United States of 42 km and a mean P-velocity of 6.6 kmps sec. For the Bolivian Andes at La Paz, the crustal thickness is 64 km and the mean P-velocity 6.7 kmps.—*from* Authors' abstract

Fields, Edward D. *See* Sayers, Robert W. 00833

00783 **Fisher, Frederick S.; Ketner, Keith B.** Late Tertiary syncline in the southern Absaroka Mountains, Wyoming, *in* Geological Survey research 1968, Chap. B: U.S. Geol. Survey Prof. Paper 600-B, p. B144–B147, illus., table, 1968.

A westward-trending syncline with at least 2,000 feet of structural relief occurs in Oligocene rocks of the southern Absaroka Mountains, Wyo. Alternate hypotheses of origin are: (1) the syncline was formerly a valley which was filled by sediments of the Oligocene Wiggins Formation; (2) the syncline is contemporaneous with the Wiggins Formation and is due to subsidence or collapse related to volcanism; or (3) the syncline was formed during regional deformation in late Tertiary time. Field relations, including the warping of a widespread erosion surface believed to have been cut prior to late Pliocene time, favor the third interpretation.—Authors' abstract

06839 **Fitch, John E.** The marine fish fauna, based primarily on otoliths, of a Lower Pleistocene deposit at San Pedro, California (LACMIP 332, San Pedro Sand): Los Angeles County Mus. Contr. Sci., no. 128, 23 p., illus., tables, 1967.

Several hundred pounds of fossiliferous "dirt" from a San Pedro sand deposit, yielded 2,746 otoliths, 584 vertebrae, 324 teeth, and 105 miscellaneous other fish remains representing at least 10 species of elasmobranchs and 30 kinds of teleosts. Since many of these fishes typically inhabit waters to the north of San Pedro, the deposit is believed to have been laid down during a period when ocean temperatures were colder than they are today at the same latitude. This deposit, one of the few remaining surface outcrops of San Pedro sand, will be destroyed by freeway construction prior to 1970.—Author's abstract

Fitzgerald, E. L. *See* Peterson, D. J. 01158

01152 **Folsom, T. R.; Sreekumaran, C.; Weitz, W. E., Jr.; Tennant, D. A.** Flame photometer specialized for cesium: Appl. Spectroscopy, v. 22, no. 2, p. 109–114, illus., table, 1968.

A new flame photometer system at Scripps Institution of Oceanography is described, with which it is possible to replicate measurements of cesium in trace quantities normally present in one liter of sea water (about 0.3μ g), with standard error of less than 2 percent. Dilute cesium solutions can be compared significantly within a few parts per billion. The system consists of two photomultiplier tubes observing the flame simultaneously, from the same aspect, but each having a different optical filter interposed. A specialized automatic sample-changing system provides for precise timing of the sample burning and carries out aspirator washings immediately after each burning. Means are provided for continuously monitoring the aspiration rate, by recording brightness of background signal independently. The table compares results from three different concentrations of cesium.—GDC

Foose, Richard M. *See* Hoy, Robert B. 01017

00955 **Fortescue, J. A. C.; Hornbrook, E. H. W.** Biogeochemical and geobotanical prospecting research away from mineral deposits in the boreal forest, *in* A preliminary study of the Moose River belt, northern Ontario: Canada Geol. Survey Paper 67-38, p. 37-44, illus., table, 1968.

The object of these studies was twofold: to obtain sets of systematic data from small selected plots in common types of plant community, and to discover if aeromagnetic anomalies had any significant correlation with biogeochemical results. Five 'areas of interest' were chosen—four in mineral terrain near Abitibi Canyon, and one in organic terrain northeast of Otter Rapids. All are in drift above Precambrian rocks; the depth of overburden was found by seismic surveys. Samples of organic soil, bark, stems, twigs, needles, and leaves were collected as well as soil, and 12 elements determined in each, of which zinc, lead, nickel, and chromium are discussed. Results show that type of vegetation rather than depth to bedrock governs minor-element results. No mineral deposits, nor correlation with aeromagnetic anomalies, were indicated.—ESL

00959 **Fortescue, J. A. C.** A small-scale stream-sediment geochemical survey in the Moose River area, *in* A preliminary study of the Moose River belt, northern Ontario: Canada Geol. Survey Paper 67-38, p. 45-48, illus., 1968.

The object of the survey was to find out if aeromagnetic anomalies or the Precambrian-Paleozoic contact were associated with significant, consistent variations in Cu, Pb, Ni, or Zn content of stream sediment samples. The stream selected flows parallel to North French River, crosses the Precambrian-Paleozoic contact 2 1/2 mi upstream from their junction, and crosses two of the larger anomalies. Small anomalies for Ni and Zn were found near the Precambrian Paleozoic contact in the north. A map accompanying the report shows geology, aeromagnetics, and results of this survey.—ESL

01097 **Fountain, D. K.** The application of the induced polarization method at Brenda mines, British Columbia: Canadian Mining and Metall. Bull., v. 61, no. 670, p. 153-157, illus., 1968.

High metal prices and advanced technology in open-pit mining methods have resulted in considerable interest in the development of large, low-grade mineral deposits. A low-grade deposit of copper-molybdenum mineralization near Penticton, B.C., is currently being tested. The mineralization of economic interest at Brenda has a total metallic sulfide content of between 1 and 1.5 percent, which approaches the limits of detectability by standard geophysical methods. However, due to a favourable geological environment, it has been possible to utilize the induced polarization method to outline the mineralization at the Brenda property.—*from* Author's abstract

Fouts, James A. *See* Salotti, Charles A. 06934

00851 **Fox, Peter Edward.** Petrology of Adamant pluton, British Columbia [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 7, p. 2900B, 1968.

06886 **Fox, William T.** Simulation models of time-trend curves for paleoecologic interetation, *in* Computer applications in the earth sciences—Colloquium on time-

series analysis: Kansas Geol. Survey Computer Contr. 18, p. 18–29, illus., table, 1967.

By plotting temperature, salinity and depth as a function of time and assigning tolerances to the organisms, it is possible to reproduce the time-trend curves based on observed data. The simulated time-trend curves provide one possible explanation for brachiopod distribution in the Richmond Group [Ordovician of Indiana]. It would be possible also to reproduce the faunal distribution with other combinations of environmental factors and tolerances. Thus, the time-trend simulation model provides a means of testing whether a hypothesis involving environmental changes is possible. For example, it was not possible to account for the entire brachiopod distribution in the Richmond Group by either temperature or depth in Models 1 and 2. It was necessary to change both temperature and depth in Models 3 and 4 to reproduce the original pattern.—Author's conclusions

00730 **Franke, O. L.** Double-mass-curve analysis of the effects of sewering on ground-water levels on Long Island, New York, *in* Geological Survey research 1968, Chap. B: U.S. Geol. Survey Prof. Paper 600-B, p.B205–B209, illus., tables, 1968.

Double-mass-curve analysis of ground-water levels in Nassau County, Long Island, shows that ground-water levels in a 50 sq mi area sewered in the early 1950's have declined an average of about ten feet relative to the unsewered area farther east. An analysis of the various factors causing this relative decline indicates that about seven feet of the decline was caused by the sewering. The decline in ground-water levels has been accompanied by a pronounced reduction in streamflow within the sewered area.—Author's abstract

Friedman, Irving. *See* Steven, T. A. 00801

01044 **Fritz, W. H.** Lower and early Middle Cambrian trilobites from the Pioche Shale, east-central Nevada, U.S.A.: Palaeontology, v. 11, no. 2, p. 183–235, illus., 1968.

Trilobites of the Upper *Olenellus* Faunizone and of the late *Albertella* and *Glossopleura* Faunizones are described from a stratigraphic section spanning the Pioche Shale [the Campbell Ranch section in White Pine County]. Four established, two undetermined, and three new species are described from the Upper *Olenellus* Faunizone, and fourteen established, five undetermined, and seventeen new species are described from the *Albertella* and *Glossopleura* Faunizones. Some of the latter are placed in two new genera, *Achlysopsis* and *Albertelloides*.—*from* Author's abstract

06806 **Fruth, Lester Sylvester, Jr.** Compaction effects and depth-pressure relationships in Bahamian sediments [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 6, p. 2479B, 1967.

00958 **Fujisawa, Hideyuki.** Temperature and discontinuities in the transition layer within the Earth's mantle—Geophysical application of the olivine-spinel transition in the Mg_2SiO_4–Fe_2SiO_4 system: Jour. Geophys. Research, v. 73, no. 10, p. 3281–3294, illus., tables, 1968.

The nature of the transition layer (C) is considered with the homogeneous chemical composition model; physical properties are determined by the mineral assemblage and Fe/Mg ratio of mantle materials. Plausible values for this ratio of mantle minerals lie between 1:9 and 2:8. The olivine-spinel transition accounts for the sharp discontinuity that starts at a depth of about 370 km in the mantle; the temperature at this depth ranges from 1150°–1530°C. Thickness of the transition region is directly related to temperature distribution. Location and sharpness of discontinuities in the layer expected from high-pressure mineralogy show substantial agreement with latest seismological evidences. The actual transition region might not spread over the entire C layer, and there is a possibility for several discontinuities in the layer that arise from successive polymorphic transitions in mantle minerals.—*from* Author's abstract

00888 **Furlow, James W.** Results of heavy mineral exploration across several Georgia coastal area shoreline ridges [abs.]: Georgia Acad. Sci. Bull., v. 26, no. 2, p. 70-71, 1968.

00948 **Gabelman, J. W.; Krusiewski, S. V.** Regional metallotectonic zoning in Mexico: Soc. Mining Engineers Trans., v. 241, no. 1, p. 113-128, illus., 1968.

Regional metallogenic zones and areas of equal paragenetic range have been interpreted from a compiled metallogenic map of Mexico. Mineralization gradients of the pattern extend inland from coastal zones of high-temperature mineralization, and join in a central longitudinal zone of relatively low-temperature mineralization. The striking regional pattern can be correlated with regional deformation gradients of similar position and orientation representing at least three major orogenic cycles in two structural belts. Paleozoic structural belts existed along each coast with deformation gradients diminishing inland toward a narrow, central peninsular craton. The Mesozoic-Tertiary Mexican belt covered the entire country with a gradient oriented toward the Gulf of Mexico. Mineralization gradients can be used to identify the regions most favorable for the occurrence of selected metals.—*from* Authors' abstract

01145 **Gaffney, Eugene S.; Zangerl, Rainer.** A revision of the chelonian genus *Bothremys* (Pleurodira, Pelomedusidae): Fieldiana—Geology, v. 16, no. 7, p. 193-239, illus., 1968.

Recent discovery of new material of *Podocnemus alabamae* Zangerl, 1948, a partial skull, mandible, and almost complete shell from the Selma Formation of Alabama, has made it necessary to assign this species to *Bothremys*. *P. barberi* Schmidt, 1940 from Kansas is considered conspecific; these turtles and new material from New Jersey are assigned to *Bothremys barberi*; three subspecies are designated A, B, and C for specimens found in the Atlantic, Gulf, and epicontinental coastal provinces, respectively, of the Late Cretaceous coastline from New Jersey to Kansas. *B. cooki* Leidy, 1865, type species, from Late Cretaceous of New Jersey, consists of skull and mandible only; until shell material is found, this is retained as a separate species, although comparative skull morphology suggests conspecificity with *B. barberi*. VMJ

Gait, G. B. *See* Eaton, W. L. 01162

01078 **Galehouse, Jon S.** Anisotropy of magnetic susceptibility as a paleocurrent indicator—A test of the method: Geol. Soc. America Bull., v. 79, no. 3, p. 387-390, illus., table, 1968.

Axes of maximum magnetic susceptibility in oriented cores of the Paso Robles Formation are parallel to the paleocurrent directions determined by other criteria.—Author's abstract

01011 **Ganguly, Jibamitra.** Analysis of the stabilities of chloritoid and staurolite and some equilibria in the system $FeO-Al_2O_3-SiO_2-H_2O-O_2$: Am. Jour. Sci., v. 266, no. 4, p. 277-298, illus., table, 1968.

Chloritoid and staurolite stabilities have been analyzed as functions of total pressure, partial pressure of oxygen, and temperature. At 10 kb, in the upper part of the magnetite field, the equilibrium relations among chloritoid, staurolite, almandine, and others, are dependent upon oxygen pressure. The staurolite field is a restricted triangle within this isobaric plane and is likely to pinch out gradually with increasing pressure. In the upper part of the magnetite field, almandine breaks down to assemblages involving respectively chloritoid, staurolite, and kyanite, in order of increasing temperature. Staurolite in natural processes is discussed; the isograds of staurolite-quartz, and kyanite-muscovite-quartz do not have significance in oxidizing environments.—*from* Author's abstract

Garde, Ramachandra J. *See* Hasan, Saiyed M. 01053

Garrison, Louis E. *See* McMaster, Robert L. 00927

00821 **Geiger, K. W.; deVries, P. H.; Withers, D. W.; Treleaven, A. L.** Water-well records, Alberta, townships 11-25 (complete to December 31, 1965): Research Council Alberta Rept. 66-4, 136 p., illus., tables, 1968.

Water-well records are an important source of near-surface geologic and hydrologic information. Most of the records presented in this preliminary report have not been previously published in any form. They represent a complete record of all available water-well data in the Groundwater Division's files for townships 11-25 inclusive. This preliminary report is the third in a series which will eventually provide similar data for all the settled areas of the province. They should be of considerable use in the evaluation of the natural resources of Alberta. A description of the system of land division and a list of licensed water-well drilling contractors are included also.—Authors' abstract

00997 **George, P. T.** Timmins District, *in* Annual report of Resident Geologists' Section, Geological Branch, 1967, Pt. 3: Ontario Dept. Mines Misc. Paper 18, p. 16-45, illus., tables, 1968.

Mineral production for 1967 is summarized; 98 percent of Ontario's silver and 30 percent of the zinc come from the Timmins area, mostly from the Ecstall mine in Kidd Township. The area also produces 45 percent of Ontario's gold. Exploration resulted in discovery of the Jameland Mines base-metal orebody; that in other areas is summarized. New information on the area includes the finding of kimberlite north of Kapuskasing, and gahnite in the Hurdman-Agate Township area. Major north-trending strike-slip faults in the Timmins area are important in interpretation. New texts and maps on the district are listed.—ESL

00894 **Giardini, A. A.** The nature of granodiorite under triaxial stress and a possible model for seismic disturbances [abs.]: Georgia Acad. Sci. Bull., v. 26, no. 2, p. 69, 1968.

00793 **Gibbs, J. F.; Willden, Ronald; Carlson, J. E.** Gravity anomalies in the Ruby Mountains, northeastern Nevada, *in* Geological Survey research 1968, Chap. B: U.S. Geol. Survey Prof. Paper 600-B, p. B88-B94, illus., 1968.

A Bouguer anomaly map of the Ruby Mountains shows steep gradients, interpreted as indicating faults, along most of the east side of the range and at the north and south ends on the west side. The thickness of low-density fill in the south end of Ruby Valley is about 5,500 feet and in the central part is about 4,600 feet. The fill in Huntington Valley is about 5,700 feet thick. Anomaly values over the range are lower than those over topographically lower bedrock areas to the east and west. It is believed that at least some of the low anomaly values are due to a granitic batholith underlying the range.—Authors' abstract

00804 **Giberson, Melbourne Fernald.** The response of nonlinear multi-story structures subjected to earthquake excitation [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 7, p. 2831B, 1968.

01049 **Giblin, P. E.** Sault Ste. Marie District, *in* Annual report of Resident Geologists' Section, Geological Branch, 1967, Pt. 2: Ontario Dept. Mines Misc. Paper 17, p. XVI-XVII, 1-71, illus., 1968.

Properties examined and described include one molybdenum (inactive), three copper (one inactive), one sulfide, and one gold. Staking, exploration, and development are summarized, and new geological information bearing on future exploration is reviewed. New maps and literature on the district are listed; a list, by townships, of new information added to the files comprises 29 pages. Recommendations are made for exploration for copper on the east shore of Lake Superior and for molybdenum between Chapleau and Wawa.—ESL

01125 **Gibson, W. M.; Wollenberg, H. A.** Investigations for ground stability in the vicinity of the Calaveras fault, Livermore and Amador Valleys, Alameda County, California: Geol. Soc. America Bull., v. 79, no. 5, p. 627-637, illus., 1968.

Geologic and geodetic studies were made in the Camp Parks area in the western part of the Livermore Valley, Calif. to determine its engineering feasibility as a site for a 4600-ft diameter, circular, 200 BeV proton accelerator. The area is underlain by the Orinda Formation of Pliocene age and Quaternary alluvium and is transected by the Calaveras, Pleasanton, and Parks faults. Reobservation of the 1964 geodetic network showed development of a subsidence basin with vertical differences on the order of 0.05 ft, consistent clockwise horizontal movement across the Pleasanton faults, and an apparent thrusting movement across the Calaveras fault. Subsidence in response to withdrawal of ground water is considered to be superimposed on tectonic movements.—*from* Authors' abstract

06807 **Girdley, William Arch.** Petrology of Pennsylvanian limestones, San Juan Mountains, Colorado [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 6, p. 2479B–2480B, 1967.

00852 **Goldak, George Robert.** A new theoretical method for the calculation of absolute structure amplitudes from the Patterson function [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 7, p. 2901B, 1968.

Goldstein, Joseph I. *See* Wasson, John T. 00905

Goodell, H. Grant. *See* Bell, David L. 06847

Goodlett, John C. *See* Denny, Charles S. 00738

01005 **Goodman, Richard E.; Taylor, Robert L.; Brekke, Tor L.** A model for the mechanics of jointed rock: Am. Soc. Civil Engineers Proc., v. 94, paper 5937, Jour. Soil Mechanics and Found. Div., no. SM3, p. 637–659, illus., tables, 1968.

Representation of discontinuities in analysis of blocky rock is discussed. A linkage type element is developed for addition of rock joint stiffness to the structural stiffness matrix describing the behavior of a system of rock blocks and joints. Basic problems of jointed rock studied demonstrate the marked influence joints may have on stress distribution, displacements, and failure pattern of structures in jointed rock. A new classification of joints is introduced, based on application of the joint element to finite element analysis of structures in jointed rock. Normal stiffness, tangential stiffness, and shear strength are used as parameters in the classification. Methods discussed allow a jointed rock mass to be treated as a system of blocks and links. The joint stiffness approach calls for detailed description of the behavior of rock blocks and rock joints independently.—*from* Authors' abstract

06767 **Gordon, Blake M.** The anatomy and morphology of *Archaeopteris macilenta*, a fossil progymnosperm [abs.]: Colorado-Wyoming Acad. Sci. Jour., v. 5, no. 8, p. 65–66, 1967.

01028 **Gorrell, H. A.; Alderman, G. R.** Elk Point Group saline basins of Alberta, Saskatchewan, and Manitoba, Canada, *in* Saline deposits—Internat. Conf. Saline Deposits, Houston, Tex., 1962, Symposium: Geol. Soc. America Spec. Paper 88, p. 291–317, illus., 1968.

The salt deposits in the Alberta basin to the northwest and the Saskatchewan basin to the southeast were connected. Deposition began earlier in the Alberta basin, resulting in two salt beds with no equivalents in the other basin. Later, in Devonian Elk Point time, the southeastward moving water became more saline, as salt deposits predominate in the southeastern basin. Subsurface solution of the salt began in the Devonian and continued until at least the Cretaceous, resulting in anomalous structural-slump features. Exploration of the salt began early and continues. Recently, the potash salts have been extensively explored and commercial production is underway.—*from* Authors' abstract

00944 **Gotautas, Vito A.** So you want to be a professional: Shale Shaker, v. 18, no. 5 [!6], p. 110–115, illus., table, 1968.

A study was made of the history, selected statistical data, and professional organizational structure of well known professions. It is concluded that the

geological profession is being cannibalized by other disciplines and has a long way to go in achieving professional status because it lacks unity and has failed to follow the professional precepts followed by all leading and recognized professions.—KAS

00991 **Goudarzi, Gus H.** Geologic map of the Hartford quadrangle, Ohio County, Kentucky: U.S. Geol. Survey Geol. Quad. Map GQ-741, scale 1:24,000, section, text, 1968.

Coal is the principal mineral resource of the Hartford quadrangle. The Nos. 9 (about 4 feet thick), 11 (3 1/2 feet thick), and 13 beds have been mined extensively; 9 and 11 are present over most of the area. Oil was produced formerly from Mississippian rocks and some natural gas has been found at depths of less than 400 feet in Pennsylvanian rocks.—MCM

00993 **Goudarzi, Gus H.; Smith, Avery E.** Geologic map of the Dundee quadrangle, Ohio County, Kentucky: U.S. Geol. Survey Geol. Quad. Map GQ-688, scale 1:24,000, section, text, 1968.

Mineral resources of the Dundee quadrangle are oil, gas, limestone, and coal. Most of the several million bbl oil has come from Chester sandstones, principally Tar Springs Sandstone, but there has been production also from Devonian, other Mississippian, and Pennsylvanian rocks. Current production of gas is limited to a few scattered wells, principally in the Big Clifty, and is entirely for domestic use. Limestone has been quarried in the Rough Creek fault zone in the Beaver Bend and Paoli Limestones. The Deanefield coal bed, about 30 inches thick, has been mined extensively.—MCM

00814 **Grafton, Dean.** In memoriam—James Richard Schwabenland, 1926–1968: South Texas Geol. Soc. Bull., v. 8, no. 4, p. 2, 1968.

06775 **Graham, Sylvia F.** Moles of the Samwel Cave fossil deposits—Additions to the Pleistocene fauna of Samwel Cave, California II [abs.]: Caves and Karst, v. 9, no. 6, p. 49, 1967.

00892 **Grant, Willard H.** Weathering, streams and structure in the central Piedmont of Georgia [abs.]: Georgia Acad. Sci. Bull., v. 26, no. 2, p. 68, 1968.

00803 **Green, Martha A.; Pickering, S. M., Jr.** Establishment of a reference fossil repository at the Department of Mines, Mining and Geology [abs.]: Georgia Acad. Sci. Bull., v. 26, no. 2, p. 70, 1968.

00907 **Greenfield, David W.** The zoogeography of *Myripristis* (Pisces, Holocentridae): Systematic Zoology, v. 17, no. 1, p. 76–87, illus., 1968.

The zoogeographic relationships of the 16 valid extant species of *Myripristis* are analyzed. These coral-reef fishes inhabit all tropical regions except the eastern Mediterranean, and the species fall into eight zoogeographic groups. The Myripristinae have been distinct since middle Eocene and were probably distributed around the world via the Tethys Sea. The incomplete fossil record includes *Stintonia* and *Weileria* from the Eocene to Miocene of the U.S. Gulf Coast and western Europe; it is not yet known if either is a direct ancestor of *Myripristis*. Evidence of changes in paleogeography and paleotemperatures from Miocene to present, together with modern ecology, ocean currents, and water temperatures, are used to reconstruct the distribution routes and the probable phylogeny of the extant species.—VMJ

00790 **Greenland, L. Paul.** Application of coincidence counting to neutron activation analysis, *in* Geological Survey research 1968, Chap. B: U.S. Geol. Survey Prof. Paper 600-B, p. B76–B78, illus., tables, 1968.

A fast coincidence-counting technique has been used to simplify the determination of cobalt and cesium in silicate rocks. After neutron irradiation, Co^{60} activity is counted directly in the sample with no chemical separations, Cs^{134} activity is counted after a rapid chemical separation from scandium. Analyses of eight U.S. Geological

Survey standard rock reference samples by this technique are presented.—Author's abstract

Griffin, James B. *See* Crane, H. R. 01120

00774 **Grimaldi, F. S.; Schnepfe, Marian M.** Determination of palladium and platinum in rocks, *in* Geological Survey research 1968, Chap. B: U.S. Geol. Survey Prof. Paper 600-B, p. B99-B103, table, 1968.

Acid-soluble palladium and platinum in rocks are determined spectrophotometrically with *a*-furildioxime and stannous chloride, respectively. Prior concentration and isolation involve coprecipitation with tellurium and extractions with methyl isobutyl ketone, diethyldithicarbamate, and *a*-furildioxime. Approximately 0.01 ppm each of Pd and Pt can be determined as a lower limit on a 10-g sample. The procedure provides for separating up to 50 μg of each element from a total of approximately 50 μg of other platinum metals. The separation and determination processes are examined in detail from the standpoint of both interferences and the measurement of small amounts of palladium and platinum.—Authors' abstract

06878 **Grogan, Robert M.; Bradbury, J. C.** Origin of the stratiform fluorite deposits of southern Illinois, *in* Genesis of stratiform lead-zinc-barite-fluorite deposits (Mississippi Valley type deposits)—A symposium, New York, 1966: Econ. Geology Mon. 3, p. 40-50, illus., table, 1967.

The stratiform fluorite deposits of southern Illinois occur in a limited section of Mississippian sedimentary carbonate rocks closely associated with faults. Ore emplacement, clearly epigenetic, involved extensive replacements as well as filling of spaces resulting from solution of the host strata by ore fluid. Fluid inclusions identify the ore fluid as concentrated hydrothermal brine basically of connate type modified by additions of magmatic and meteoric waters. The presence of alkalic igneous dikes and intrusive breccias support a magmatic source for most or all fluorine and metals and for thermal convection of ore fluid. Isotopic data identify the lead components as of J-type.—*from* Authors' abstract

01110 **Gualtieri, J. L.** Geologic map of the Wildie quadrangle, Garrard and Rockcastle Counties, Kentucky: U.S. Geol. Survey Geol. Quad. Map GQ-684, scale 1:24,000, section, text, 1968.

Coal from the No. 2 Lee seam has been mined above Brush Creek and Wolf Creek in the southeastern part of the Wildie quadrangle. Laminated siltstone beds of the Wildie Member of the Borden Formation formerly were quarried for dimension stone. Limestone of good quality is available from the Newman Limestone in the eastern section. Stream gravel is used locally as road metal for light-duty roads.—MCM

01111 **Gualtieri, J. L.** Geologic map of the Johnetta quadrangle, Rockcastle and Jackson Counties, Kentucky: U.S. Geol. Survey Geol. Quad. Map GQ-685, scale 1:24,000, section, text, 1968.

Coal has been mined intermittently and on a small scale in several places in the Johnetta quadrangle, mainly from the Lee No. 1 and No. 2 beds. Limestone useful for road metal and agricultural lime is available in parts of the Newman Limestone.—MCM

00841 **Guild, P. W.** Metallotects of North America [abs.]: Econ. Geology, v. 63, no. 1, p. 90, 1968.

00999 **Guillet, G. R.** Southern Ontario, *in* Annual report of Resident Geologists' Section, Geological Branch, 1967, Pt. 4: Ontario Dept. Mines Misc. Paper 19, p. vii-ix, 1-33, illus., tables, 1968.

A search for sphalerite in Silurian dolomite of the Bruce Peninsula stemmed from geochemical anomalies, but drilling revealed a lack of vertical continuity. Interesting uranium values have been found southwest of Bancroft, and a new discovery was

made southeast of Minden. A marble deposit suitable for whiting for the filler industry was located between Lorimer and Limestone Lakes. Mercury was discovered in a barite vein near Clyde Forks. Favorable zones for molybdenite were explored in Brougham, Cardiff, and Monmouth Townships. Low columbium values were found in syenite beneath Callander Bay. Maps show sand and gravel producers of the area, and bedrock formations with quarry locations. New literature on the area is listed.—ESL

00812 **Guthrie, R. D.** Paleoecology of the large-mammal community in interior Alaska during the late Pleistocene: Am. Midland Naturalist, v. 79, no. 2, p. 346–363, illus., table, 1968.

This study of the paleoecology of four fossil assemblages of large mammals from the late Pleistocene sediments near Fairbanks emphasizes the structure, composition, habitat, and the pattern of subsequent extinction of the community. All four faunas were composed predominantly of grazers. Bison, horse, and mammoth were the most common species. Many component species of this complex community of large mammals became extinct near the close of the Wisconsin glaciation, leaving the comparatively depauperate community that exists in Alaska today. The high percentage of grazers in the fossil community suggests that interior Alaska was a grassland environment during the late Pleistocene.—Author's abstract

00739 **Guy, Harold P.** Quality control of adjustment coefficients used in sediment studies, *in* Geological Survey research 1968, Chap. B: U.S. Geol. Survey Prof. Paper 600-B, p. B165–B168, illus., tables, 1968.

The means of a group or groups of sample data are often used to quantify a population. The algebraic method of evaluating a mean or the ratio of two means is rather cumbersome and therefore too infrequently used. This paper presents alinement charts and a simplified procedure for quality evaluation and control for such means and ratios. The evaluation of adjustment coefficients commonly used to adjust single-vertical measurements of suspended-sediment concentration by measurements of the cross-sectional concentration is illustrated.—Author's abstract

00875 **Hackett, Gary Kenneth.** Ultrasonic absorption and dispersion in a limestone [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 7, p. 2985B–2986B, 1968.

Hall, G. F. *See* Walker, P. H. 00898

Hall, G. F. *See* Walker, P. H. 00902

Hamano, Y. *See* Takeuchi, Hitoshi. 00968

Hamelin, Louis-Edmond. *See* Cailleux, André. 06843

00885 **Harrison, Robert Alan.** Slump and diapiric structures in the Coastal Plain of Stewart County, Georgia [abs.]: Georgia Acad. Sci. Bull., v. 26, no. 2, p. 68, 1968.

06947 **Hartenstein, W. G.** Hydrocarbon whys and wherefores: Oil and Gas Jour., v. 65, no. 52, p. 200–213, illus., 1967.

Paleozoic sedimentation in the Appalachian province occurred in a series of genetically related, cyclic, episodes consisting of similar sequences of lithologic units, erosional vacuities, and major hiatuses, reflecting the progress of the erosional depositional advance from orogeny to base level. The Medina series sandstones were deposited in a deltaic environment as a basal detrital lithosome following diastrophic changes that reorientated Appalachian sedimentation from that of an open marginal, extracontinental geosyncline receiving craton-derived sediments to that of a closed marginal, frontal geosyncline receiving sediments from an adjacent upthrusted mountain front. This particular combination was uniquely suited to generation, migration, accumulation, and preservation of hydrocarbons.—*from* Author's summary

00737 **Harvey, Richard D.** Mineralogy and petrography of carbonate rocks related to control of sulfur dioxide in flue gases—A preliminary report: Illinois Geol. Survey Environmental Geology Note 21, 9 p., illus., tables, 1968.

The mineralogy and petrography of 10 carbonate rock samples, previously tested for SO_2 absorption by the Public Health Service, are presented. Results show that the greater the percentage of Ca and Mg carbonates in the rock, the greater will be the reactivity with the SO_2 of flue gases.—KAS

01053 **Hasan, Saiyed M.; Garde, Ramachandra J.** Riverbed degradation below dams—Discussion [of paper 5335 by S. Komura and D. B. Simons, 1967]: Am. Soc. Civil Engineers Proc., v. 94, paper 5920, Jour. Hydraulics Div., no. HY3, p. 759-764, illus., 1968.

The writers express appreciation for the rigorous method presented (ibid., v. 93, no. HY4, p. 1-14, 1967) for estimating degradation in both transient and final phase; two minor corrections are made and some experimental work is described. Estimation of the rate of degradation by plotting observed data for the initial period on a semilog scale is illustrated for the experiments and for Fort Randall and Milburn Dams.—ESL

Hasegawa, Y. *See* Takeuchi, Hitoshi. 00968

06808 **Haselton, George Montgomery.** Glacial geology of Muir Inlet, southeastern Alaska [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 6, p. 2480B, 1967.

Hathaway, John C. *See* Trumbull, James V. A. 00741

00941 **Hawley, C. C.; Robeck, R. C.; Dyer, H. B.** Geology, altered rocks and ore deposits of the San Rafael Swell, Emery County, Utah: U.S. Geol. Survey Bull. 1239, 115 p., illus., tables, geol. maps, 1968.

Pennsylvanian to Cretaceous rocks exposed in this breached anticline are discussed. The fold formed in earliest Tertiary time. Pipelike collapse structures, of probable solution origin, and numerous high-angle faults occur. Many of the Mesozoic rocks have been altered by bleaching, pyritization, and petroleum introduction. Uranium also occurs in the Chinle and other formations. Most of the ore is localized by channel structures, small-scale sedimentary structures, and bedding plane and related low-angle slips. Some small cross-cutting ore bodies also occur. The ore commonly fills pores. Numerous other metal deposits are present.—*from* Authors' abstract

01140 **Hawley, C. C.; Clark, Allen L.** Occurrences of gold and other metals in the upper Chulitna district, Alaska: U.S. Geol. Survey Circ. 564, 21 p., illus., tables, 1968.

Gold and other metals form deposits in three parts of the upper Chulitna district, near Colorado Creek, the Golden Zone in Bryn Mawr Creek, and Long Creek. Trace amounts of gold in thick quartz veins are in the major Blind Creek fault zone; scattered small vein deposits and anomalous amounts of gold and other metals in stream sediments indicate widespread mineralization. Mineral occurrences at Colorado Creek and the Golden Zone, associated with small quartz diorite porphyry stocks, are of vein, disseminated, and breccia-pipe types. Gold accounts for most of their value, but deposits are complex and contain abundant arsenic and locally abundant antimony, copper, silver, and zinc, and some molybdenum, tin, cadmium, and bismuth. Deposits at Long Creek, apparently clustered around small quartz porphyry plugs, contain copper, subordinate amounts of gold and silver, and trace amounts of tin and molybdenum.—*from* Authors' abstract

Hay, W. W. *See* Bolli, H. M. 01070

00844 **Haycocks, Christopher.** Centrifugal model study and finite element analysis of stress near a fault [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 7, p. 2874B, 1968.

06830 **Hayes, John B.** Geodes and concretions from the Mississippian Warsaw Formation, Keokuk region, Iowa, Illinois, Missouri: Mineral Explorer, v. 2, no. 3, p. 1–5, abridged 1967; originally published 1964.

The full paper appeared in Jour. Sed. Petrology, v. 34, no. 1, p. 123–133, 1964.—GDC

01131 **Hazel, Joseph E.** Ostracodes from the Brightseat Formation (Danian) of Maryland: Jour. Paleontology, v. 42, no. 1, p. 100–142, illus., tables, 1968.

Thirty-five ostracode species were found at outcrops in western Prince Georges County, Md. Thirteen species are new, and the new genus *Opimocythere* of the Brachycytheridae is described. Only seven of the Brightseat species are known to occur in the overlying Aquia Formation. The presence of 13 Brightseat species in Gulf Coastal Plain deposits indicates correlation with the Kincaid and Clayton Formations, probably the upper parts of these units. The Brightseat is placed in the *Globigerina daubjergensis-Globorotalia compressa* zone of the Danian Stage, or lower Midwayan in the provincial terminology of Murray (1961). The Brightseat assemblages are dominated (average of 65 percent of individuals) by three species of Cytherideinae and two of Brachycytheridae. An inner sublittoral depositional depth is indicated.—*from* Author's abstract

06851 **Heinrich, E. W.** Carbonatites—Nil-silicate igneous rocks: Earth-Sci. Rev., v. 3, no. 4, p. 203–210, 1967.

This paper is a review of the more important facts, ideas, and discoveries in the study of carbonatites during the last decade. All evidence is shown to affirm the igneous nature of these carbonate rocks.—Author's summary

06864 **Helgeson, Harold C.** Silicate metamorphism in sediments and the genesis of hydrothermal ore solutions, *in* Genesis of stratiform lead-zinc-barite-fluorite deposits (Mississippi Valley type deposits)—A symposium, New York, 1966: Econ. Geology Mon. 3, p. 333–338, illus., 1967.

Interstitial sea water in buried arkosic sediments at temperatures as low as 200°C may derive more than a part per million lead from K-feldspar as the solution phase equilibrates with its environment. The amounts of pore solution, source rock, and time required to derive and transport sufficient quantities of lead for subsequent deposition of major ore deposits of galena are geologically realistic. Calculations for lead derived from metamorphism of arkosic sediments provide an insight into the general requirements for "source bed" genesis of hydrothermal ore-forming solutions.—Author's abstract

01148 **Henbest, Lloyd G.** Diagenesis in oolitic limestone of Morrow (Early Pennsylvanian) age in northwestern Arkansas and adjacent Oklahoma: U.S. Geol. Survey Prof. Paper 594-H, p. H1–H22, illus., 1968.

The environment, time relation, and causes of some common kinds of diagenetic reconstructions are indicated. The first main diagenetic stage consisted of microstylolitic interpenetration of contact supported ooliths, a compaction syndrome. Subsequently in Morrow(?) time, a reaction and exchange between aragonite, quartz, and calcite occurred within minute closed systems (radius 0.01 to 1.0 mm) in an inferred environment of connate, noncirculating marine water and normal temperature. The reaction resulted in near completion of cementation (inferred), solution etching and pitting of quartz grains at interfaces with the calcitic matrix of the ooliths, and secondary enlargement of quartz grains at contacts with the aragonite of the ooliths. Here, cementation was not a barrier to solution etching, secondary enlargement of quartz, or to calcite-quartz exchange.—LGH

01072 **Hendricks, D. M.; Whittig, L. D.** Andesite weathering—[Pt.] 1, Mineralogical transformations from andesite to saprolite: Jour. Soil Sci., v. 19, no. 1, p. 135–146, illus., 1968.

Petrographic and quantitative mineralogical analyses of two andesites and their saprolite from the Cascade Range in California reveal a mineral weathering sequence

related to crystal size and composition and to weathering environment. Both the hypersthene andesite and olivine andesite studied have been subjected to moderate to intensive leaching by acid solutions percolating through superjacent soil; weathering to saprolite has followed a similar progression. During early stages large hypersthene phenocrysts are most resistant; following in decreasing order of resistance are plagioclase phenocrysts and fine-grained mafic minerals, olivine, and glassy matrix material. Quartz is relatively stable in earliest stages, but decreases rapidly with increased weathering. Free iron oxides and clay increase with increased weathering. Amorphous clay dominates early stages, but later kaolin increases relative to amorphous clay.—*from* Authors' summary

01073 **Hendricks, D. M.; Whittig, L. D.** Andesite weathering—[Pt.] 2, Geochemical changes from andesite to saprolite: Jour. Soil Sci., v. 19, no. 1, p. 147–153, tables, 1968.

Using isovolumetric method of analysis, it is observed that all major chemical constituents except ferric iron and lattice water suffer loss during weathering of hypersthene- and olivine-andesite to saprolite in an acid leaching environment; Si, Ca, K, and Na are removed rapidly during early weathering stages of both rocks. Mg loss is delayed because it is found in both rocks in relatively large hypersthene phenocrysts which tend to resist weathering. Total Fe, Al, and Ti show moderate losses during weathering. During weathering of the two rocks, loss of Si, Al, and total Fe is relatively greater from hypersthene andesite; this is believed due to greater leaching intensity and greater acidity of leaching solution at the hypersthene andesite location. In addition, more pronounced alternate wetting and drying, occurring at the olivine-andesite location, exert a strong influence in stabilizing Fe and Al.—*from* Author's summary

Hepp, Mary-Margaret. *See* Skipp, Betty, 00996

01116 **Heroy, William B.** Thermicity of salt as a geologic function, *in* Saline deposits—Internat. Conf. Saline Deposits, Houston, Tex., 1962, Symposium: Geol. Soc. America Spec. Paper 88, p. 619–629, illus., 1968.

The salt in the Gulf Coast geosyncline probably reaches a depth of 30,000–40,000 feet, as indicated by geophysical profiles. At these depths, the salt is estimated to be about 450°–500°F. Because plasticity of salt increases rapidly with temperature, movement of salt upward through the sediments would be facilitated and the formation of vertical structures more easily explained. In certain wells in Texas, near salt domes, the temperatures are higher than expected from the normal geothermal gradient. This increase may be caused by the salt in the structures having retained much of its connate temperature as it moved toward the surface.—*from* Author's abstract

06809 **Hess, David Filbert.** Geology of pre-Beltian rocks in the central and southern Tobacco Root Mountains, with reference to superposed effects of the Laramide-age Tobacco Root batholith [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 6, p. 2480B–2481B, 1967.

00837 **Heyl, Allen V.** The 38th parallel lineament and its relationship to ore deposits [abs.]: Econ. Geology, v. 63, no. 1, p. 88, 1968.

06876 **Heyl, Allen V.** Some aspects of genesis of stratiform zinc-lead-barite-fluorite deposits in the United States, *in* Genesis of stratiform lead-zinc-barite-fluorite deposits (Mississippi Valley type deposits)—A symposium, New York, 1966: Econ. Geology Mon. 3, p. 20–29, illus., 1967.

Low-temperature stratiform deposits found in the United States in the Appalachian Valley and Ridge province, greater Mississippi Valley, and scattered districts in the western mountains have similar geologic features but variations in lead-isotopes, mineralogy, trace elements, geochemistry of ore-forming fluids, and other features indicate diverse origins. The Appalachian Valley deposits of Tennessee may have been deposited by heated early Paleozoic metamorphic hydrothermal solutions formed in the volcanic and tectonic belt of the Piedmont; in the Mississippi Valley main solution depositing ores were probably connate brines heated to 100°C and

enriched by potassium-rich fractions; and in the west deposits are probably from low-temperature hydrothermal fluids, mainly ground water magmatically heated in a granitic province.—*from* Author's abstract

01012 **Hills, John M.** Permian Basin field area, west Texas and southeastern New Mexico, *in* Saline deposits—Internat. Conf. Saline Deposits, Houston, Tex., 1962, Symposium: Geol. Soc. America Spec. Paper 88, p. 17–27, illus., 1968.

The geological history of this area is outlined cursorily in preparation for a field trip. The Tobosa basin formed in early and middle Paleozoic time in the southern part of the region, and grew larger during the Pennsylvanian and Permian. A ridge divided the large basin into two beginning in the Mississippian. The sedimentary history from Permian to present is outlined, with emphasis upon salt-bearing beds. In general, the Permian is marked by withdrawal of the sea in the area, with an increase in saline residues in the younger beds to the south. Finally, the evaporites filling the basin were covered by red shale and sand, and Permian sedimentation in the United States came to an end.—HRC

06887 **Hingorani, Gangu G.; Marczynski, Louis F.** Prediction of multiple time series generated by stationary random process, *in* Computer applications in the earth sciences—Colloquium on time-series analysis: Kansas Geol. Survey Computer Contr. 18, p. 30–36, illus., tables, 1967.

In the time series generated by a random process each observation is unique. The vast majority of physical data falls in the nonstationary area. If the data are slowly changing with time, the area is considered stationary. Selective partitioning groups a given nonstationary time series into a sequence of stationary time series. A finite state machine is set up which consists of linear predictor operators for each partition of the time series and a director to tell the machine when to change from one state to the next. It is assumed that not all past data are significant to the prediction of future values. An example is given of the seismic correlation problem from which the geologic structure may be inferred.—GDC

01029 **Hite, Robert J.** Salt deposits of the Paradox Basin, southeast Utah and southwest Colorado, *in* Saline deposits—Internat. Conf. Saline Deposits, Houston, Tex., 1962, Symposium: Geol. Soc. America Spec. Paper 88, p. 319–330, illus., 1968.

Thick salt deposits are present in the Paradox Member of the Hermosa Formation [Middle Pennsylvanian]. Data suggest that the original thickness was from 5,000 to 6,000 feet, but locally, deformation and flow have resulted in thicknesses as great as 14,000 feet. Each salt bed is part of a series of evaporite cycles showing lateral and vertical facies changes. Varve counts in the salt beds give an indication of deposition rates of time-equivalent carbonate rocks. Black shales interbedded in the salt suggest euxinic conditions. Many of the salt anticlines in the basin were formed along trends of originally thick salt beds, and upward growth of these anticlines possibly began during the late stages of salt deposition.—*from* Author's abstract

06858 **Hoagland, Alan D.** Interpretations relating to the genesis of East Tennessee zinc deposits, *in* Genesis of stratiform lead-zinc-barite-fluorite deposits (Mississippi Valley type deposits)—A symposium, New York, 1966: Econ. Geology Mon. 3, p. 52–58, illus., 1967.

Important zinc deposits occur in a narrow stratigraphic zone (less than 4 percent of the carbonate section), 200 feet thick, in Lower Ordovician dolomiized limestone and dolomite. The selectivity of mineralization with respect to this restricted horizon is related to the permeability established initially by post-Lower-pre-Middle Ordovician weathering. Release of connate water from limestones is suggested as a possible mechanism or factor in preparation of host rock for ore deposition and may have played an active role in mineralization. Mineralization occurred before or during an early stage in the Middle Ordovician marine sedimentation. Although there are no known igneous rocks which might have been a source of metal or energy, mineral zoning is associated with these deposits. Genetic theory would be advanced significantly by a regional geochemical study.—*from* Author's abstract

06946 **Hobson, G. D.** Hudson Bay undergoes study: Oil and Gas Jour., v. 65, no. 51, p. 118–126, illus., 1967.

The topography of Precambrian basement rocks beneath Hudson Bay was mapped by a conventional marine-seismic survey conducted during 1965. The greatest depth from sea level to basement rocks is 6,585 feet in the west-central part of the bay where the water is 680 feet deep. Overlying sediments of Proterozoic, undifferentiated Ordovician and Silurian, Early or Middle Devonian, and Late Devonian or Early Cretaceous ages were mapped separately on the basis of interpretations of seismic velocities. Possible origins of an enigmatic central shoal are hypothesized.—CAS

06939 **Hobson, George D.; Carr, P. A.** Hammer seismic survey, Moncton map-area, New Brunswick: Canada Geol. Survey Paper 65–43, 9 p., illus., 1967.

The bedrock topography in the Moncton, New Brunswick, area has been compiled from seismic investigations, outcrop elevaions, and borehole data. The seismic data were obtained by using a model MD-1 hammer refraction seismograph as an adjunct to geological and hydrogeological studies in the area. In general, the present day drainage system is controlled by the ancestral drainage system developed on the bedrock. Neither bedrock lithology nor bedding can be differentiated on a basis of distinct and diagnostic seismic velocities. The sharp bend in the Petitcodiac River at Moncton existed in the ancestral drainage system. Bedrock geology and bedrock topography are presented in separate figures.—Authors' abstract

06825 **Hochbaum, H. Albert.** Contemporary drainage within true prairie of the Glacial Lake Agassiz Basin, *in* Life, land and water—Conference on environmental studies of the Glacial Lake Agassiz region, 1966, Proc.: Manitoba Univ. Dept. Anthropology Occasional Paper 1, p. 197–204, 1967.

The various bodies of standing water and swamps in the Lake Agassiz basin are described, their origin being emphasized. Marshes of all sorts—in kettles, river floodplains, ground-moraine areas, and oxbows—are the heritage of the lake. These bodies are being drained to increase the amount of farm land and an exhortation is made to investigate the long-term results.—HRC

01103 **Hofrichter, Erich.** Stratigraphy and structure of the Palangana salt dome, Duval County, Texas, *in* Saline deposits—Internat. Conf. Saline Deposits, Houston, Tex., 1962, Symposium: Geol. Soc. America Spec. Paper 88, p. 365–379, illus., 1968.

Twenty-five test wells have been drilled in the Palangana salt dome. The plug is white and gray halite, and anhydrite is unevenly distributed within the mass. Four stratigraphic units are recognized: the San Diego group, the Palangana group, the Benavides group, and the Anhydritic group, although relative ages cannot be determined. The lack of common salt minerals (carnallite, kieserite, polyhalite, and langbeinite) is noteworthy. The potash beds are composed of sylvine. Internal structures are complicated, and steeply dipping beds are present. The structures are similar to those in the Winnfield Dome, Louisiana, and to those in northwestern Germany. The geologic age of the Palangana salt could not be determined.—*from* Author's abstract

06922 **Hollenbeck, R. P.; Browning, J. S.; McVay, T. L.** Industrial sand in Pike County, Kentucky: Kentucky Geol. Survey, ser. 10, Rept. Inv. 7, 30 p., illus., tables, 1967.

Sampling of a sandstone deposit on Pine Mtn. near Elkhorn City is described; results of beneficiation tests and potential markets are discussed. The production of high-silica glass sand in Pike County could be large because of the extent of this deposit in sandstones and conglomerates of the Lee Formation in the county and adjoining areas in Virginia. Previous production and laboratory research tests on bulk samples indicate the technical feasibility of high-purity sand that meets glass-sand specifications. Chemical and screen analyses of both sandstone and conglomerate are included; silica content is 99.30 percent for each. A larger market appears necessary for an economic operation.—GDC

Holser, W. T. *See* Mattox, Richard B. 01119

01024 **Holser, William T.** Chemistry of brine inclusions in Permian salt from Hutchinson, Kansas [abs.], *in* Saline deposits—Internat. Conf. Saline Deposits, Houston, Tex., 1962, Symposium: Geol. Soc. America Spec. Paper 88, p. 537, 1968.

06954 **Hooijer, D. A.** Pleistocene vertebrates of the Netherland Antilles, *in* Pleistocene extinctions—The search for a cause—Internat. Assoc. Quaternary Research, 7th Cong., 1965, Proc., V. 6: New Haven, Conn., Yale Univ. Press, p. 399–406, illus., 1967.

Vertebrate remains in cave and fissure deposits in late-Quaternary limestones in Curaçao and Aruba include an extinct muskrat which became extinct finally on Martinique at the start of this century. Fossil teeth of the cotton rat and cane rat have been found on Aruba. The capybara, found fossil in Curaçao, must be considered endemic on the island, pointing to a more moist climate than now. A small ground sloth from Curaçao belongs to a group of late-Pleistocene–early historic megalonychids of Cuba, Hispaniola, and Puerto Rico. The skeleton was found associated, and a snout has teeth in occlusion, indicating mummification before fossilization, and hence a dry climate then. Remains of gigantic land tortoises in Curaçao are the first found in the southern Antilles.—*from* Author's abstract

01068 **Hooke, Roger LeB.** Laboratory study of the influence of granules on flow over a sand bed: Geol. Soc. America Bull., v. 79, no. 4, p. 495–499, illus., tables, 1968.

Flume studies show that the addition of granules to flows over dune-covered sand beds produces armored troughs between dunes and a decrease in the friction factor and sediment discharge. Armoring probably is responsible for the latter two effects by decreasing the amplitude of bed forms. Addition of granules to flows over a flat sand bed caused an increase in both friction factor and sediment discharge. An uneven granule concentration produced a stable hump—analogous to a gravel bar in a natural stream—on the sand bed. This hump adjusted the depth and velocity of flow which balanced the sediment discharge elsewhere in the flume.—EHP

01079 **Hooke, Roger LeB.** Model geology—Prototype and laboratory streams—Discussion [of paper by Per Bruun, 1966]: Geol. Soc. America Bull., v. 79, no. 3, p. 391–393, 1968.

Bruun's attempt (ibid., v. 77, no. 9, p. 959–973, 1966) to model a hydraulic system with flow over a sand bed may lead to better understanding of pertinent variables controlling sediment transport but cannot provide reliable quantitative data on geomorphic problems. A more productive approach is to consider the laboratory system as a system in its own right, not as a scale model of a prototype.—*from* Author's conclusions

Hornbrook, E. H. W. *See* Fortescue, J. A. C. 00955

00845 **Hornsey, Edward Eugene.** A theoretical investigation of elastic and voigt transient spherical waves, and plane three-element viscoelastic waves [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 7, p. 2880B, 1968.

00776 **Hosterman, John W.** Use of the diffracted-beam monochromator in X-ray diffraction of clay minerals, *in* Geological Survey research 1968, Chap. B: U.S. Geol. Survey Prof. Paper 600-B, p. B117–B118, illus., 1968.

The diffracted-beam crystal monochromator eliminates the unexplained fictitious peaks that may occur between 4° and 9° 2θ on X-ray diffraction traces of clay minerals that are exposed to high-intensity Cu radiation. The diffraction traces of clay minerals are also more easily duplicated regardless of how the sample is prepared. In addition, the monochromator completely eliminates $K\beta$ radiation and secondary fluorescence, increases the peak-to-background ratio, and sharpens the resolution.—Author's abstract

01000 **Houston Geological Society.** Edward Lawrence Grubbs (1927–1968): Houston Geol. Soc. Bull., v. 10, no. 9, p. 26, 1968.

01001 **Houston Geological Society.** James R. Schwabenland (1926–1968): Houston Geol. Soc. Bull., v. 10, no. 9, p. 25, 1968.

01017 **Hoy, Robert B.; Foose, Richard M.; O'Neill, B. J., Jr.** Structure of Winnfield salt dome, Winn Parish, Louisiana [abs.], *in* Saline deposits—Internat. Conf. Saline Deposits, Houston, Tex., 1962, Symposium: Geol. Soc. America Spec. Paper 88, p. 409–410, 1968.

06785 **Hsu, K. Jinghwa.** Mesozoic geology of the California Coast Ranges—A new working hypothesis, *in* Étages tectoniques—Colloque de Neuchâtel, Neuchâtel Univ. Inst. Géol., 1966: Neuchâtel, Switzerland, La Baconnière, p. 279–296, illus., 1967.

Recent field studies suggest that Franciscan rocks of the California Coast Ranges were detached and thrust westward during or after the Late Jurassic, and that the Coast Range Batholith is probably an autochthonous window. Previous theories have assumed autochthonous deformation of Franciscan rocks. The Franciscan complex with its exotic blocks resembles the chaotic terrane of the *argille scagliose* of the Apennine Mts. of Italy. A window of autochthonous miogeosynclinal rocks intruded by remobilized basement under the Franciscan allochthon compares tectonically with the Alpi Apuane wndow. A great unconformity separates rocks of the Coast Ranges into a basement complex that was severely deformed by alpine-apennine type thrusting and sliding during Mesozoic orogenies, and superjacent rocks that were deformed in the Cenozoic by a distinctly different tectonic style of folding and faulting.—JPF

00914 **Huag, Pat; Schnoes, H. K.; Burlingame, A. L.** Aromatic carboxylic acids isolated from the Colorado Green River Formation (Eocene): Geochim. et Cosmochim. Acta, v. 32, no. 3, p. 358–361, illus., 1968.

Several series of aromatic carboxylic acids (including mono-, di-, and trimethyl benzoic; mono-, di-, and trimethyl propanoic; mono- and dimethyl butanoic; indanoic and tetrahydronaphthoic; and naphthoic acids) have been isolated from the extract of Colorado Green River Shale. Gas liquid chromatographic and both low and high resolution mass spectrometric techniques were utilized for separation and characterization respectively.—Authors' abstract

Huang, W. H. *See* Stueber, A. M. 00903

00995 **Huber, N. King.** Geologic map of the Shuteye Peak quadrangle, Sierra Nevada, California: U.S. Geol. Survey Geol. Quad. Map GQ–728, scale 1:62,500, separate text, 1968.

The text contains descriptions of map units: Quaternary alluvial, talus, and glacial deposits; Tertiary trachybasalt; Jurassic and Cretaceous granitic rocks; and pre-Jurassic, Triassic or Jurassic small intrusive masses of uncertain ages relative to other granitic units. Tables indicate chemical analyses of selected rock samples, and their C.I.P.W. norms and modes. An inset specific gravity map shows variation within major plutonic units and location of samples. Modes are plotted.—MCM

Hubert, A.E. *See* Lovering, T. G. 00773

Hubert, Arthur E. *See* Curtin, Gary C. 01143

00795 **Huffman, Claude, Jr.** Copper, strontium, and zinc content of U.S. Geological Survey silicate rock standards, *in* Geological Survey research 1968, Chap. B: U.S. Geol. Survey Prof. Paper 600–B, p. B110–B111, tables, 1968.

Copper, strontium, and zinc values determined by an atomic absorption spectrophotometric method are presented for six U.S. Geological Survey rock standards: granite (G–2), granodiorite (GSP–1), andesite (AGV–1), peridotite (PCC–1), dunite (DTS–1), and basalt (BCR–1).—Author's abstract

01147 **Hülsemann, Jobst.** Calcium carbonate, organic carbon, and nitrogen in sediments from drill holes on the continental margin off Florida: U.S. Geol. Survey Prof. Paper 581-B, p. B1-B10, illus., 1968.

Organic constituents of 47 sediment samples from six drill holes on the continental shelf, the upper Florida-Hatteras Slope, and the Blake Plateau off Florida suggest deposition of two facies throughout the Cenozoic. One facies, characteristic of the Blake Plateau, contains low organic carbon and nitrogen, uniform carbon-nitrogen ratios, and high calcium carbonate; the other, characteristic of the shelf and upper slope, has higher organic carbon and nitrogen, carbon-nitrogen ratios that increase with age, and lower calcium carbonate. Differences in concentrations of organic constituents are correlated with changes in rates of sediment supply and accumulation that apparently relate to nearby tectonic movements rather than climatic changes. In the sampled area the upper slope is the most favorable site for accumulation of organic matter.—*from* Author's abstract

Humphrey, William E. *See* Kozary, Myron T. 01037

06774 **Huntoon, Peter.** Karst springs in the Tapeats Amphitheater, Grand Canyon [abs.]: Caves and Karst, v. 9, no. 6, p. 50, 1967.

00906 **Hurley, Patrick M.** Absolute abundance and distribution of Rb, K and Sr in the Earth: Geochim. et Cosmochim. Acta, v. 32, no. 3, p. 273-283, illus., tables, 1968.

The discovery of a new method of determining the absolute abundance of K and Rb in the Earth within narrow limits of uncertainty leads to the determination of Sr through the growth of radiogenic Sr-87. In 10^{15} metric ton units the Earth contains 800 of K, 2.3 of Rb, and 70 of Sr. In the crust, the concentration of Rb is 45 percent, of K 31 percent, and of Sr 13 percent. The mean Sr-87:Sr-86 value in the crust is 0.7090, and in the mantle 0.7035. The radiogenic Sr-87 is 950×10^{10} tons in the crust and 3020×10^{10} tons in the mantle. In order to develop the radiogenic Sr-87 in the mantle and crust, trace elements of the crust must have separated continuously at a rather uniform rate, starting about 3400 m.y. ago. The relative abundance of Sr in the Earth is almost equal to that in chondrites. The less volatile elements closely equal their chondrite abundances.—*from* Author's summary

Hurley, R. J. *See* Bolli, H. M. 01070

Hurst, Vernon J. *See* Medlin, Jack H. 06931

00877 **Husid, Raúl.** Gravity effects on the earthquake response of yielding structures [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 7, p. 2832B, 1968.

01032 **Hutchison, W. W.; Roddick, J. A.** Machine retrieval and processing recording for geologic data: Western Miner, v. 41, no. 2, p. 39-43, illus., 1968.

A coding system, useful for machine retrieval and processing, has been designed for field mapping of data from approximately 40,000 stations in the coastal mountains of British Columbia. The data are recorded on punched cards and magnetic tapes, indexed for rapid access. Station locations are automatically digitized from base maps.—*from* Authors' abstract

06938 **Hutchison, W. W.** Prince Rupert and Skeena map-area, British Columbia: Canada Geol. Survey Paper 66-33, 27 p., illus., tables, geol. map, 1967.

Prince Rupert (east half) and Skeena map-areas cross the Coast Mts. between lat 54 and 55° N. and abut the Alaska Panhandle; they are underlain mainly by a NW-trending zone of gneiss and migmatite flanked and penetrated by large bodies of plutonic rock. Sediments and volcanics in the western half, thought to be late Paleozoic or early Mesozoic, are regionally metamorphosed to gneisses and schists. Sediments in the eastern half are unmetamorphosed and are of Late Jurassic and Early Cretaceous age. Plutonic rocks (almost half exposed rocks), mainly diorite, quartz diorite, granodiorite, and quartz monzonite, are regarded as post-Early

Cretaceous and commonly grade into the Paleozoic gneiss complex. Major faults probably underlie some of the pronounced NW-trending channels. Several old prospects of gold, copper, silver, zinc, iron, limestone, and salt occur within the area.—*from* Author's abstract

01166 **Hyndman, Donald W.** Mid-Mesozoic multiphase folding along the border of the Shuswap metamorphic complex: Geol. Soc. America Bull., v. 79, no. 5, p. 575–587, illus., table, 1968.

The high-grade regional metamorphism of the Shuswap complex of southeastern British Columbia, previously thought to be Precambrian, is shown here to be post-Triassic, probably Jurassic, by correlation of fold generations with those of low-grade rocks of the nearby Slocan Group of Triassic age. Both rock units have undergone the same three generations of folding. Intense isoclinal recumbent folding of the first generation was accompanied by regional metamorphism, axial plane schistosity, and penetrative axial lineation. Following regional metamorphism, the second deformation produced macroscopic, nearly upright folds and strain-slip cleavage. Third deformation accompanied intrusion of granitic plutons and produced mesoscopic folds coplanar in any single domain. Earlier linear structures were deformed into small cones about third fold axes.—RAL

01004 **Idriss, I. M.** Finite element analysis for the seismic response of earth banks: Am. Soc. Civil Engineers Proc., v. 94, paper 5929, Jour. Soil Mechanics and Found. Div., no. SM3, p. 617–636, illus., tables, 1968.

The seismic response of earth banks is studied by the finite element method. The appropriate extent of the bank to be included in the analysis is ascertained by studying several sections of varying extents and observing the influence of the boundaries on the response values. The effects of the division of the bank are examined by increasing the number of divisions and observing the influence on the response values. Based on these results, criteria for the appropriate division and extent of earth banks on either rigid or flexible foundations are proposed. An independent check on the results is provided by the fact that the response values of the parts of the bank well behind the crest and well beyond the toe of the slope approach those of corresponding semi-infinite layers.—*from* Author's abstract

00933 **Imlay, Ralph W.** Lower Jurassic (Pliensbachian and Toarcian) ammonites from eastern Oregon and California: U.S. Geol. Survey Prof. Paper 593-C, p. C1-C51, illus., tables, 1968.

Many ammonite genera of late Pliensbachian age occur in the Suplee and Nicely Formations in east-central Oregon, in the Hurwal Formation in northeastern Oregon, and in the Sailor Canyon Formation in east-central California. The ammonite assemblage includes many genera that are common in the Mediterranean region and lacks genera that are common in northwest Europe and Alaska. Ammonites representing most of late Toarcian time occur in the basal part of the Snowshoe Formation in east-central Oregon.—RWI

01126 **Isacks, Bryan; Page, Robert.** Comment on paper by C. Lomnitz, 'Statistical prediction of earthquakes' [1966]: Rev. Geophysics, v. 6, no. 1, p. 99–100, 1968; reply to C. Lomnitz [1968], ibid., p. 102, 1968.

Isacks and Page give arguments to show that Lomnitz incorrectly suggests (ibid., v. 4, no. 3, p. 377–393, 1966) that the discrepancy between distribution of earthquakes in time and a Poisson distribution can be attributed to spatial inhomogeneity. His explanation is based on misapplication of the compound Poisson distribution. It is shown that the simple Poisson process is a rational basis for analysis of distribution of events in time even if spatial distribution is inhomogeneous.—VSN

06810 **Jacobs, Alan Martin.** Pleistocene proto-cirque hollows in the Cataract Creek valley, Tobacco Root Mountains, Montana [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 6, p. 2481B, 1967.

00878 **Jaeger, Ralph Roger.** Shock effects in and the origin of iron meteorites [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 7, p. 2755B–2756B, 1968.

01088 **Jaffe, Howard W.; Klein, Cornelis, Jr.** Exsolution lamellae and optic orientation of clinoamphiboles: Science, v. 160, no. 3829, p. 776–778, illus., 1968.

Exsolution lamellae are abundant in coexisting hornblende and cummingtonite, and in hornblende coexisting with anthophyllite in Ordovician volcanics metamorphosed in the kyanite and sillimanite zones in central Massachusetts and adjacent New Hampshire. The lamellae have the same orientation relative to the internal structure as the (100) and (001) exsolution lamellae in clinopyroxenes, but are indexed (100) and ($\bar{1}$01) with the C2/m space group commonly chosen for amphiboles Specimens from the kyanite zone contain very thin (100) and ($\bar{1}$01) lamellae. In the sillimanite zone, both lamellae are thicker and more abundant in iron-rich specimens than in magnesian specimens. The ($\bar{1}$01) lamellae allow correct determination of relations between optic vibration directions and crystallographic axes for two alternatively selected space group C2/m and I2/m.—*from* Authors' abstract

06811 **Janssens, Adriaan.** Analysis of the Paleozoic movements of the Cincinnati Arch [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 6, p. 2481B–2482B, 1967.

00835 **Jenks, William F.** Origin of Vermont copper ores and its bearing on exploration [abs.]: Econ. Geology, v. 63, no. 1, p. 89, 1968.

00853 **Jennings, Ted Vernon.** Structural analysis of the northern Bighorn Mountains, Wyoming [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 7, p. 2901B, 1968.

06872 **Jensen, M. L.; Dessau, G.** The bearing of sulfur isotopes on the origin of Mississippi Valley type deposits, *in* Genesis of stratiform lead-zinc-barite-fluorite deposits (Mississippi Valley type deposits)—A symposium, New York, 1966: Econ. Geology Mon. 3, p. 400–408, illus., 1967.

The characteristics of the δS^{34} results obtained from sulfate minerals in Mississippi Valley type deposits are suggestive of sulfur of bacteriogenic origin. No evidence of such a spread of δS^{34} values is known for any unmetamorphosed, nonbiogenic sulfide deposits. The porous and permeable bioherm or reef structures provide favorable mineralizing sites, with a supply of residual organic material needed as an energy source by the anaerobes; they are logical sites for the passage of large quantities of fluids. In such systems, even trace amounts of lead and zinc would be precipitated by the bacteriogenic H_2S as relatively insoluble sulfides. The low-temperature environment is as favorable for the common presence of the sulfate-reducing bacteria as is the comparatively common occurrence of the Mississippi Valley type of sulfide mineralization.—*from* Authors' summary

01113 **Jensen, Mead LeRoy.** Isotopic geology and the origin of Gulf Coast and Sicilian sulfur deposits, *in* Saline deposits—Internat. Conf. Saline Deposits, Houston, Tex., 1962, Symposium: Geol. Soc. America Spec. Paper 88, p. 525–536, illus., 1968.

Native sulfur and associated calcite may have a bacterial origin as indicated by geologic and isotopic composition. The δS-34 values of the sulfides exhibit the characteristic variable enrichment of S-32 over that in the inferred sulfate source. Anaerobes reduced sulfate to sulfide which was then oxidized to native sulfur inorganically. Organic matter or petroleum constituents provided the energy source for the anaerobes. Field and laboratory data show that anaerobes produce isotopically heavier carbon dioxide and lighter methane. The cap-rock calcite with native sulfur in Gulf Coast salt domes is highly enriched in C-12, suggesting it formed from bacterial methane which was oxidized to carbon dioxide and then reacted with calcium ions derived from the sulfate.—*from* Author's abstract

Johns, W. D. *See* Stueber, A. M. 00903

00917 **Johnson, J. Harlan.** Lower Cretaceous algae from Texas—Pt. 1, Fossil algae from the Buda Limestone of Texas: Colorado School Mines Prof. Contr., no. 4, p. 1–28, illus., tables, 1968.

Twelve species of algae belonging to nine genera are described and illustrated from the Buda Limestone of Cenomanian age. The algae are distributed among three families of red algae, and two families of green algae. Described as new are *Permocalculus budaensis*, *P. budaensis* variety *pygmaea*, *Arabicodium texana*, *Neomeris budaense*, and *Cympolia perkinsi*.—Author's summary

00918 **Johnson, J. Harlan.** Lower Cretaceous algae from Texas—Pt. 2, Pre-Buda Lower Cretaceous algae from Texas: Colorado School Mines Prof. Contr., no. 4, p. 29-71, illus., tables, 1968.

Seventeen species belonging to ten genera of algae are described and illustrated. There are three genera of red algae; the others are green. Described as new are *Parachaetetes keithii*, *P. lobatum*, *Permocalculus walnutense*, and *Acicularia comanchense*.—Author's summary

00735 **Johnson, James N.** Steady profile of a finite-amplitude kinematic wave on a glacier: Jour. Glaciology, v. 7, no. 49, p. 117-119, 1968.

The steady profile of a finite-amplitude kinematic wave on a glacier is calculated with the assumption that the wave velocity varies linearly with h_i, the departure of the ice thickness from the datum state. If the flow of ice is due mainly to sliding of the glacier on its bed, the width of the calculated steady profile is several hundred times the datum state ice thickness. The width of an observed kinematic wave front on Nisqually Glacier, Mt. Rainier, Washington is at least an order of magnitude smaller than the calculated steady profile. This indicates that the observed steepening of the wave may be due to an effect other than variation of wave velocity with ice thickness.—Author's abstract

00915 **Johnson, P. W.; Sanderson, R. B.** Spring flow into the Colorado River, Lees Ferry to Lake Mead, Arizona: Arizona Land Dept. Water Resources Rept. 34, 26 p., illus., tables, 1968.

As the Colorado River cut a canyon through the thick section of sedimentary rocks, the ground water in them drained into the gorge, and today issues as springs near the bottom of the canyon. Occurrence and movement of ground water are a function of the geologic structure, character of surface materials in recharge areas, amount of precipitation, geohydrologic characteristics of rock sequence in canyon walls, and other factors. Four main tributaries and their associated springs, and many small springs and seeps contribute inflow to the river in the 300-mile reach from Lees Ferry to Lake Mead. A generalized section shows relation of springs to water-bearing rocks in the Grand Canyon; tabulated information includes chemical analyses of water from inflow sources.—MCM

01025 **Jones, C. L.** Halite and associated rocks in the salt anticline region, Colorado and Utah [abs.], *in* Saline deposits—Internat. Conf. Saline Deposits, Houston, Tex., 1962, Symposium: Geol. Soc. America Spec. Paper 88, p. 538, 1968.

01026 **Jones, C. L.** Some geologic and petrographic features of Upper Permian evaporites in southeastern New Mexico [abs.], *in* Saline deposits—Internat. Conf. Saline Deposits, Houston, Tex., 1962, Symposium: Geol. Soc. America Spec. Paper 88, p. 538-539, 1968.

Jones, D. L. *See* McElhinny, M. W. 01101

Jones, J. I. *See* Bolli, H. M. 01070

Jones, R. L. *See* Ahmad, N. 01094

Jones, R. L. *See* Ahmad, N. 01095

00942 **Jordan, Stuart P.** Will Zama be duplicated at Quill Lake, Sask.: Oilweek, v. 19, no. 2, p. 10-12, illus., 1968.

A thick potential reef-type reservoir rock has been discovered in the Prairie Evaporite at Quill Lake. A diagrammetric interpretation compared with the Zama

field, Alberta, shows similar depositional conditions; a cross section is constructed.—ESL

00904 **Jovanovic, S.; Reed, G. W.** Hg in metamorphic rocks: Geochim. et Cosmochim. Acta, v. 32, no. 3, p. 341–346, illus., tables, 1968.

The concentration of Hg in the regionally metamorphosed pelitic schists, gabbroic rocks and in quartz, magnetite and hematite from metamorphosed iron-formation rocks studied, range from tenths of ppb to tenths ppm. The concentrations did not vary in a systematic way. However, in stepwise heating experiments the fraction of the total Hg released at higher temperatures, i.e. above 450°C, generally tended to increase with the reported increase in metamorphic grade. This is analogous to trends noted in chondritic meteorites. The Hg may thus reflect the thermal history of the sample and serve as a possible geothermometer.—Authors' abstract

00899 **Juang, T. C.; Uehara, G.** Mica genesis in Hawaiian soils: Soil Sci. Soc. America Proc., v. 32, no. 1, p. 31–35, illus., 1968.

Mica identified in the wet uplands of Hawaii is thought to be pedogenic in origin. Analysis shows the mica to be a mixed layer mineral containing montmorillonite-vermiculite and some chlorite. A purified sample contained 7.2 percent potash. The absence of this mineral in the parent rock and the improbability of contamination are cited as evidence for its pedogenic nature. Potassium concentration by biological recycling is proposed as a factor in mica genesis. Editor's brief

00824 **Jungmann, William L.; Williams, Charles C.** Geology and ground water in Labette County, Kansas: U.S. Geol. Survey Hydrol. Inv. Atlas HA-279, scale 1:63,360, section, text, 1968.

Consolidated aquifers in Labette County (Bandera and Labette Shales) , yield water of good to fair quality in ranges of 40–50 gpm; both yield and chemical quality range within wide limits in the same formation. Unconsolidated aquifers are the best potential sources; Wisconsin and Recent deposits which underlie the flood plain of the Neosho River and other streams are the most likely to yield water in sufficient quantity and quality for small industry and housing development. In some areas, groups of wells or collection galleries may obtain as much as 100 gpm. Illinoian deposits yield about 10–20 gpm of good to fair quality water to wells. Some sources may be inadequate during years of drought. A generalized section shows water-bearing characteristics; analyses of water from representative wells are tabulated.—MCM

Kastner, J. *See* Feige, Y. 00967

Kauffman, Erle G. *See* Dane, Carle H. 01035

00910 **Keech, C. F.; Dreeszen, V. H.** Geology and ground-water resources of Fillmore County, Nebraska, *with a section on* Chemical quality of the water, by L. R. Petri: U.S. Geol. Survey Water-Supply Paper 1839-L, p. L1–L27, illus., tables, 1968.

Although Big Blue River tributaries have eroded valleys in the Nebraska loess plain, much of the original surface is intact; the plain is characterized by broad flats and shallow undrained depressions. Fillmore County in the eastern part of the plain is underlain by unconsolidated Quaternary deposits to depths 80–450 feet; the upper part is largely wind-deposited clayey silt, the lower part stream-deposited sand and gravel—all mantle an eroded surface of marine-deposited Cretaceous strata. Lower Quaternary deposits are saturated and constitute a highly productive aquifer, the saturated zone ranging from 20–350 feet in thickness. Replenishment, principally from precipitation, is believed to average about 1.4 in. per yr. Water levels in wells are declining because quantity pumped exceeds average annual recharge. Ground water is hard and of calcium bicarbonate type.—*from* Authors' abstract

06835 **Keller, W. D.** Geologic occurrences of clay-mineral layer silicates, *in* Layer silicates—A.G.I. short course lecture notes, New Orleans, La., Nov. 17–19, 1967:

Washington, D.C., Am. Geol. Inst., p. WK1–WK105, WKR1–WKR25, illus., tables, 1967.

Clay minerals are the most abundant minerals in the most abundant rocks at the surface, and also occur as hydrothermal alteration products. This large volume requires a genetic classification, based upon process: crystallization from solution, replacement, weathering, diagenesis, reconstitution and ion exchange, and hydrothermal alteration of minerals and rocks. Numerous examples are cited. Some clays have been synthesized in the laboratory.—HRC

06930 **Kelley, R. W.; Farrand, W. R.** The glacial lakes around Michigan: Michigan Geol. Survey Bull. 4, 23 p., illus., table, 1967.

Geological information reveals that the Great Lakes evolved from the most complex succession of freshwater lakes known to geologists. This booklet summarizes the geologic history of the Great Lakes for the general reader. Only several prominent lake stages associated with major glacier readvances during Wisconsin time are described and illustrated. Basic concepts of glacial geology are discussed briefly. Also, the names, levels, outlets, and geologic dating of the entire sequence of glacial and post-glacial stages are listed in a reference table.—*from* Authors' abstract

00882 **Kelly, A. R.** The importance of steatite in Georgia prehistory [abs.]: Georgia Acad. Sci. Bull., v. 26, no. 2, p. 74–75, 1968.

01100 **Kepferle, Roy C.** Geologic map of the Shepherdsville quadrangle, Bullitt County, Kentucky: U.S. Geol. Survey Geol. Quad. Map GQ-740, scale 1:24,000, section, text, 1968.

Limestone and dolomite have been quarried from the Louisville Limestone and Laurel Dolomite, and dimension stone from the Laurel and from turbidite siltstone in the lower part of the Borden Formation in the Shepherdsville quadrangle. Silty clay in lacustrine deposits of the Borden may be suitable for brick and tile. Sideritic ironstone concretions from the lower part of the shale member of the Borden were reduced in smelters in the mid-1800's; one or two layers of concretions are particularly persistent. Barite, sphalerite, and celestite occur in geodes and in some of the sideritic nodules that have developed septarian fractures.—MCM

Kerr, P. F. *See* Nash, J. T. 00830

00807 **Kesling, Robert V.; Paul, Christopher R. C.** New species of Porocrinidae and brief remarks upon these unusual crinoids: Michigan Univ. Mus. Paleontology Contr., v. 22, no. 1, p. 1–32, illus., table, 1968.

Four new species of Porocrinidae include two of *Porocrinus [P. elegans, P. pyramidatus]* and two of the new genus *Triboloporus [T. cryptoplicatus* (type species), *T. xystrotus*. These and three other well-founded species of *Porocrinus*, here described for comparison, are all from the Middle and Upper Ordovician of eastern and east-central North America.] Pore structures, exceptional in crinoids, seem to have been functional and used in respiration. Their development at plate corners was related to structural need in the calyx, whereby ridges between plate centers provided strength and rigidity and at the same time freed large intervening areas for the extremely thin, deeply folded goniospires.—Authors' abstract

00740 **Ketner, Keith B.** Origin of Ordovician quartzite in the Cordilleran miogeosyncline, *in* Geological Survey research 1968, Chap. B: U.S. Geol. Survey Prof. Paper 600-B, p. B169–B177, illus., tables, 1968.

Ordovician quartzite deposits in the Cordilleran miogeosyncline extend from the Peace River, British Columbia, to Owens River, southern California. The hypothesis is offered that almost all the sand composing these deposits was eroded from Cambrian sandstone formerly covering the Peace River–Athabaska arch in northern Alberta. This sand probably entered the geosyncline at about lat 56° N. and was swept southward at least as far as southern California. The evidence is as follows: (a) the presence of an adequate source of sand in northern Alberta and the apparent absence of adequate sources elsewhere, (b) the progressively decreasing age of basal

quartzite beds from north to south, (c) the southerly decreasing thickness and increasing width of the deposits, (d) the southerly decreasing grain size, and (e) a southerly trend toward improved sorting.—Author's abstract

Ketner, Keith B. *See* Fisher, Frederick S. 00783

Khandelwal, Suresh. *See* Bohor, Bruce F. 00823

00884 **Kilbourne, Richard T.** The depth, temperature, and salinity of the late Pleistocene sea in southern Maine [abs.]: Georgia Acad. Sci. Bull., v. 26, no. 2, p. 74, 1968.

Kinoshita, Willie T. *See* Wright, Thomas L. 00980

06812 **Kissling, Don Lester.** Environmental history of lower Chesterian rocks in southwestern Indiana [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 6, p. 2482B, 1967.

Kittleman, L. R. *See* Benson, G. T. 01038

Klein, Cornelis, Jr. *See* Jaffe, Howard W. 01088

Kleinhampl, Frank J. *See* Albers, John P. 00840

01129 **Klement, William, Jr.; Cohen, Lewis H.** High-low quartz inversion—Thermodynamics of the lambda transition: Jour. Geophys. Research, v. 73, no. 6, p. 2249–2259, illus., 1968.

Data for the volume, specific heat, thermal expansion, and elastic moduli of quartz near the high–low inversion are compared, and a preferred set is obtained for discussion of the thermodynamics of the lambda transition. Previous discussions involving the Pippard relations and the relations and results of Garland are critically reviewed and quantitatively extended. Garland's relations appear to be a suitable framework for correlating available data; suggestions are made for the smoothing and testing of future data.—Authors' abstract

01033 **Klovan, J. E.** Selection of target areas by factor analysis: Western Miner, v. 41, no. 2, p. 44–50, 52, illus., tables, 1968.

Factor analysis is a technique by which a linear combination of many measurements made on a number of variables may be combined in such a way as to delineate an ore body. In essence, it finds new, more fundamental qualities (the factors) underlying measured variables. An hypothetical model has been devised which illustrates a typical, though simple, exploration situation and the kinds of answers available through factor analysis.—*from* Author's abstract

01056 **Klovan, J. E.** Q-mode factor analysis program in FORTRAN IV for small computers, *in* Computer programs for multivariate analysis in geology: Kansas Geol. Survey Computer Contr. 20, p. 39–51, tables, 1968.

Q-mode factor analysis is a multivariate quantitative technique that may be used to study and portray the interrelationships between geologic items such as rock samples, fossil collections, etc. Detailed descriptions of the method and its application have been presented, but these were designed for large computers. The program described here is being used with an IBM system 360 Model 30, but is easily adapted to other computers. A maximum of 60 items and 60 properties can be analyzed at one time.—ESL

06950 **Kohls, D. W.; Rodda, J. L.** Iowaite, a new hydrous magnesium hydroxide–ferric oxychloride from the Precambrian of Iowa: Am. Mineralogist, v. 52, nos. 9–10, p. 1261–1271, illus., tables, 1967.

Iowaite occurs as bluish-green crystals up to 2–3 mm in length in association with chrysotile, dolomite, brucite, calcite, magnesite, and pyrite in serpentinite at 1000–1500 feet deep in Sioux County, Iowa. On exposure to the atmosphere the crystals turn whitish green with a rusty overtone, owing to loss of zeolitic water. The mineral

is insoluble in water but readily soluble in mineral acids. Hardness is about 1.5; density (obs.), 2.11±0.02 g/cc; basal cleavage is perfect; optically uniaxial negative, with $\omega = 1.543$ and $\epsilon = 1.533$ (both ±0.005). The mineral is hexagonal with $a = 3.119 \pm 0.005$, $c = 24.25 \pm 0.02$ A, $Z = 1$ [4 Mg (OH)$\geq$FeOCl-x H_2O, with x up to 4]. The four strongest observed X-ray lines are 8.109 (100), 4.047 (40), 2.363 (27), 2.019 (23).—MEM

06891 **Koopmans, L. H.** A comparison of coherence and correlation as measures of association for time or spacially indexed data, *in* Computer applications in the earth sciences—Colloquium on time-series analysis: Kansas Geol. Survey Computer Contr. 18, p. 1–4, illus., 1967.

Time series or numerical sequences indexed by a space parameter are of considerable interest in geology, as for example in measuring thickness of varves or terrain heights; two or more measurements may be made at each time or space index. For a mathematical idealization of the time series, the sample correlation coefficient and sample coherences can be viewed as estimates of overall parameters. On the basis of a simple relationship, reasons are given for preferring coherence as a measure of linear dependence between pairs of time series. In a 1400-year varve sequence from the Rita Blanca lake beds in Texas (Anderson and Koopmans, in press) the correlation coefficient provided misleading information about the linear dependence between measurements of clay content and calcium carbonate, which was later clarified by computing coherences.—GDC

Kosarev, G. L. *See* Savarenskiy, Ye. F. 06928

00794 **Koyanagi, Robert Y.** Hawaiian seismic events during 1965, *in* Geological Survey research 1968, Chap. B: U.S. Geol. Survey Prof. Paper 600-B, p. B95–B98, illus., 1968.

During 1965, 565 earthquakes having magnitudes of 2.0 to 4.6, were located in the Hawaiian Islands. These are exclusive of some 300 associated with the December 24–25 eruption of Kilauea Volcano. In all, nearly 30,000 earthquakes were recorded during 1965. The active volcanoes Mauna Loa and Kilauea on the island of Hawaii were zones of highest seismic concentration. In addition to 69 shocks reported as felt by local residents during 1965, many more were felt during the December swarm but were not properly documented.—Author's abstract

01037 **Kozary, Myron T.; Dunlap, John C.; Humphrey, William E.** Incidence of saline deposits in geologic time, *in* Saline deposits—Internat. Conf. Saline Deposits, Houston, Tex., 1962, Symposium: Geol. Soc. America Spec. Paper 88, p. 43–57, illus., 1968.

Evaporitic deposits ranging in age from Precambrian to Recent are present on all continents and in more than half of those sedimentary basins in which strata of marine origin have been demonstrated to exist. Much of our knowledge of the extent and character of saline materials is a concomitant of exploration for various types of petroleum, and a striking coincidence between the sites of the principal oil-producing provinces and the occurrence of evaporites suggests the possibility of a significant relationship. As with commercial deposits of hydrocarbons, by far most saline deposits are found in the northern hemisphere.—Authors' abstract

01047 **Krawiec, Wesley.** Recent sediments of the Louisiana inner continental shelf [abs.]: Houston Geol. Soc. Bull., v. 10, no. 8, p. 21, 1968.

06881 **Krumbein, W. C.** Autocorrelation, spectral analysis, and Markov chains [abs.], *in* Computer applications in the earth sciences—Colloquium on time-series analysis: Kansas Geol. Survey Computer Contr. 18, p. 77, 1967.

Krusiewski, S. V. *See* Gabelman, J. W. 00948

Kubota, H. *See* Bradshaw, R. L. 01118

Kulm, LaVerne D. *See* Byrne, John V. 00943

06823 **Kupsch, Walter O.** Postglacial uplift—A review, *in* Life, land and water—Conference on environmental studies of the Glacial Lake Agassiz region, 1966, Proc.: Manitoba Univ. Dept. Anthropology Occasional Paper 1, p. 155–186, illus., 1967.

The idea that postglacial uplift of formerly glaciated tracts in Fennoscandia and North America is mainly the result of the removal of the superimposed weight of the glacial ice on the crust is not criticized in principle, but a review of the observations on which this idea is based shows that in places detailed information is lacking, and that other possible causes are generally not considered. The various observations and conclusions are summarized, and a series of statements about known information is given. The author does not hold to any particular point of view, however. Much of the data comes from the Lake Agassiz region.—HRC

01151 **Kusler, David J.; Corre, H. A.** Limestone resources in western West Virginia: U.S. Bur. Mines Inf. Circ. 8369, 76 p., illus., tables, 1968.

The Greenbrier Limestone, although generally at a depth greater than 1,000 feet, is the only locally available potentially large source of limestone in western West Virginia which relatively sparse data suggest may be suitable for most physical and some chemical process uses. Data concerning its distribution, configuration, and minability, compiled from published and unpublished sources, are related to compositional and economic factors that affect use of limestone.—APB

01059 **Kustra, C. R.** Port Arthur district, *in* Annual report of Resident Geologists' Section, Geological Branch, 1967, Pt. 1: Ontario Dept. Mines Misc. Paper 16, p. 21–29, illus., table, 1968.

Seven metal mining operations were active in the Port Arthur district during 1967, and one operation quarried amethystine quartz. Re-evaluation, by underground diamond drilling and sampling, of a former gold mine and a former silver mine were undertaken. Exploration activity was relatively vigorous, especially in the Pigeon River district, which produced most of the tabulated assessment information. Nine properties examined and described include the Thunder Bay amethyst mine, five sulfide prospects, and one feldspar mine.—ESL

LaChance, Thomas P. *See* McMaster, Robert L. 00927

00901 **Lai, T. M.; Mortland, M. M.** Cationic diffusion in clay minerals—[Pt.] 1, Homogeneous and heterogeneous systems: Soil Sci. Soc. America Proc., v. 32, no. 1, p. 56–61, illus., 1968.

Diffusion of Na or Cs ions in expanded Na-vermiculite, with both internal and external surface available for diffusion, decreased with increasing diffusion time, a characteristic of heterogeneous systems. Diffusion of these ions remained constant in collapsed K-vermiculite, having only external surface available, making it homogeneous. The property of homogeneity was also confirmed in Na- and K-kaolinite; while the heterogeneous property was observed in Na- and K-bentonite. The diffusion of Na ions in Na-vermiculite was related to a mathematical model derived originally for solving the grain boundary problem, and the diffusion coefficient of external surface was found to be five times larger than that of interlayer surface.—*from* Authors' abstract

Lakin, H. W. *See* Lovering, T. G. 00773

Lakin, Hubert W. *See* VanSickle, Gordon H. 01141

Lakin, Hubert W. *See* Curtin, Gary C. 01143

06860 **Lamarche, Robert Y.** Geology of Beauvoir-Ascot Corner area, Sherbrooke, Richmond and Compton counties [also French edition]: Quebec Dept. Nat. Resources Prelim. Rept. 560, 16 p., table, geol. maps, 1967.

Except for two small lamprophyre dikes, all rocks are Paleozoic, the oldest being the Ascot Formation of pre-Middle Ordovician age. A major intrusion of albite granite took place during the Lower Ordovician, and during the Acadian orogeny

dikes and sills of diorite and stocks of gabbro were intruded. The lamprophyre dikes are related to Jurassic or Cretaceous Monteregian intrusives. Structural features are described. Sulfides occur in the area, and sand, gravel, and crushed stone are worked. Assay results on stream sediment samples are shown on the Ascot Corner sheet, which with the Beauvoir sheet, accompanies the report.—ESL

00982 **Lampe, R. K.** James Dwight Dana [1813–1895]: Earth Sci., v. 21, no. 3, p. 124–125, portrait, 1968.

01135 **Lange, Arthur L.** The changing geometry of cave structures—Pt. 2, The exponential solution gradient: Caves and Karst, v. 10, no. 2, p. 13–19, illus., 1968.

When the rate of solution of cave water decreases exponentially with depth, a vertical plane wall dissolves inward with time, assuming the profile of a logarithmic sine curve. The condition is probably approached in nature in cave and surface lakes due to several natural phenomena, particularly that of surface wave motion; however, the effect is likely to be masked by other cave processes.—Author's conclusion

01155 **Lange, Arthur L.** The changing geometry of cave structures—Pt. 1, The constant solution gradient: Caves and Karst, v. 10, no. 1, p. 1–10, illus., 1968.

A constant solution gradient—one in which the rate of solution decreases linearly with depth—causes a submerged planar wall to rotate outward as though mounted on a hinge. Such a process would occur in an almost stagnant cave chamber, where the more saturated water drifts to the bottom, setting up the described gradient. The effect should not be confused with planes of repose which have a similar appearance, but rather result from the inhibition of solution by insoluble sediment accumulating on positive slopes.—KAS

00957 **Larochelle, A.** Paleomagnetism of the Monteregian Hills—New results: Jour. Geophys. Research, v. 73, no. 10, p. 3239–3246, illus., tables, 1968.

Paleomagnetic directions were obtained for 74 stably and homogeneously magnetized cores drilled at 16 sites on 4 of 8 basic intrusive plugs in southeast Quebec, the Monteregian Hills. A statistical analysis of these data shows that the mean directions (regardless of polarity) of magnetization of the 4 sampled bodies were not significantly distinct after the cores were "cleaned" in an alternating field of 250 oe. Because of their high precision it is proposed that the data supersede a set from the same series of rocks published 5 years ago. The 74 directions yielded a paleomagnetic pole at 171.2° W., 69.9° N., in good agreement with poles derived from 6 different areas in North America and regarded as reliable estimates for the Cretaceous period. The high coherency of the Cretaceous poles estimated from North America rocks supports the view that the Earth's field was dipolar at that time.—*from* Author's abstract

00935 **LaSala, A. M., Jr.** Ground-water resources of the Hamden-Wallingford area, Connecticut: Connecticut Water Resources Bull. 14, 18 p., illus., tables, geol. map, 1968.

The area, in south-central Connecticut, is drained by the Quinnipiac and Mill Rivers. Eastward dipping Triassic rocks underlie most of the area. Glacial deposits of Wisconsin age overlie the bedrock, and are overlain in places by windblown deposits, alluvium, and swamp deposits. Bedrock yields from a few gallons of water to 500 gpm; ice-contact deposits yield as much as 1,750 gpm in individual wells, and outwash sand and gravel up to 400 gpm. Quality is good. Natural discharge is about 26 billion gallons a year, and much of it can be salvaged. Additional wells can be drilled, the ice-contact deposits offering best possibilities for development, with a large recharge potential from the rivers. [Maps show bedrock contours and surficial geology, and water-table contours.]—*from* Author's abstract

Lawrence, D. E. *See* Aumento, F. 00985

00951 **Lea, Graham.** The computer, exploration aid: Oilweek, v. 19, no. 6, p. 28, 30, 1968.

Theoretical pioneers have provided many new computer techniques for exploration that have not been applied seriously. There should be a strong move by senior geologists, engineers, and geophysicists toward trying these, or mathematical geoscience may develop along undesirable lines. Methods for investigating the potential of the computer in exploration are suggested. Interpretation of computer-derived results should pose no greater problem than interpreting logs. Information sources are listed, and the question of pattern recognition is discussed.—ESL

06915 **Leblond, Robert.** Le Saint-Laurent—Orientation bibliographique: Cahiers Géographie Québec, v. 11, no. 23, p. 418-464, 1967.

This bibliography is intended as a starting point for those who wish to examine the Saint Lawrence area. It contains cataloged references to all aspects of the geographic area, including geology and geomorphology.—HRC

Lee, Fitzhugh T. *See* Carroll, Roderick D. 00792

00975 **Lee, Hulbert A.** An Ontario kimberlite occurrence discovered by application of the glaciofocus method to a study of the Munro esker: Canada Geol. Survey Paper 68-7, 3 p., illus., 1968.

By inference from glaciofocus techniques, the presence of concentration peaks of pyrope garnet in the Munro esker has led to the discovery of a body of kimberlite in the Upper Canada mine, Gauthier Township, Ontario, 10 miles east of Kirkland Lake.—*from* Author's introduction

00956 **Lewis, Brian T.; Meyer, Robert P.** A seismic investigation of the upper mantle to the west of Lake Superior: Seismol. Soc. America Bull., v. 58, no. 2, p. 565-596, illus., tables, 1968.

Observations of seismic waves generated by explosions in Lake Superior during the Early Rise Experiment have been made westward to a range of 2600 km. A phase filtering technique is applied to both the compressional and shear wave portions of the seismograms. The P velocity increases in a series of discontinuities to a depth of 500 km; the most important of these are increases from 8.2 to 8.47 kmps at 126 km, and from 8.9 to 9.5 kmps at 450 km. Q for P waves appears to decrease below 126 km. The increase in P velocity at 126 km is probably accompanied by a decrease in shear velocity from about 4.7 to 3.9 kmps, with corresponding increase of Poisson's ratio, bulk modulus and density, and decrease in rigidity; shear velocity then increases to 5.0 kmps at 220 km. A comparison of Rayleigh wave phase velocities for this model with the Canadian Shield and midwest United States data is favorable.—*from* Authors' abstract

06813 **Lewis, Charles Frederick Michael.** Sedimentation studies of unconsolidated deposits in the Lake Erie basin [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 6, p. 2482B-2483B, 1967.

Libby, W. F. *See* Berger, Rainer. 01121

00970 **Lindsley, D. H.; Carmichael, I. S. E.; Nicholls, J.** Iron-titanium oxides and oxygen fugacities in volcanic rocks—A correction: Jour. Geophys. Research, v. 73, no. 10, p. 3351-3352, 1968.

Simple reactions are considered which demonstrate the error of a conclusion in the paper by Carmichael and Nicholls (ibid., v. 72, p. 4665, 1967) that "if the composition of the iron-titanium oxide minerals that precipitate from a silicate liquid reflects the ferric-ferrous equilibrium the oxygen barometer of Buddington and Lindsley [1964] will have to be calibrated. . ." The activities of magnetite and hematite in the respective coexisting β and α phases will define the oxygen fugacity at a given temperature and pressure regardless of the nature of the environment in which the oxide pair is found.—DBV

Lipps, Emma Lewis. *See* Nunan, Walter Edward. 00890

Lipps, Lewis. *See* Ray, Clayton E. 00891

00733 **Lofgren, Ben E.** Analysis of stresses causing land subsidence, *in* Geological Survey research 1968, Chap. B: U.S. Geol. Survey Prof. Paper 600-B, p. B219-B225, illus., 1968.

Land subsidence in areas of intensive ground-water withdrawal is attributed to the compaction of deposits caused by increased effective loading stresses. As demonstrated at the Pixley recorder site [San Joaquin Valley, Calif.], subsidence is related directly to effective-stress changes computed from water-level data. Effective-stress changes are sometimes difficult to calculate in a complex of aquifer systems, even with ample water-level data. Effective stresses are changed in two principal ways: (1) Water-table fluctuations change the buoyant support of grains in the zone of the change, and (2) a change of the water table or of the piezometric head, or both, may induce hydraulic gradients and seepage stresses in the deposits. These stress changes are additive in their effect, and together cause compaction.—Author's abstract

06814 **Long, Clarence Sumner.** Basal Cretaceous strata, southeastern Colorado [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 6, p. 2483B, 1967.

00879 **Long, Sumner.** Some aspects of depositional regressions in tectonically stable basins [abs.]: Georgia Acad. Sci. Bull., v. 26, no. 2, p. 73, 1968.

06865 **Love, Leonard G.** Diagenesis and the origin of the ores, *in* Genesis of stratiform lead-zinc-barite-fluorite deposits (Mississippi Valley type deposits)—A symposium, New York, 1966: Econ. Geology Mon. 3, p. 343-347, 1967.

More attention than hitherto should be paid to examination of sedimentological features of ore deposits and the strata bearing them for evidence of the presence of the ore minerals during diagenesis of the sediments. Examples are quoted which are typical of the work recorded so far, from Missouri, Arkansas, and Europe. Details are given of progress in the characterization of diagenetic pyrite, including the framboidal texture, for application in such studies.—Author's abstract

Loveday, J. *See* McIntyre, D. S. 01066

00998 **Lovell, H. L.** Kirkland Lake and Cobalt districts, *in* Annual report of Resident Geologists' Section, Geological Branch, 1967, Pt. 3: Ontario Dept. Mines Misc. Paper 18, p. viii, 1-15, illus., table, 1968.

In 1967, only one of the gold mines in the rich Kirkland Lake area was in production, but the Kerr-Addison mine, Larder Lake area, still produces. Silver-cobalt ore is mined in Cobalt and Gowganda-Elk Lake, and geochemical surveys are being carried on. Activity in other areas is summarized. Geological factors in future mineral exploration in the Shiningtree-Matchewan-Kirkland Lake-Larder Lake area are discussed and include former volcanism, intrusion, and sedimentation centered on the Round Lake dome.—ESL

00773 **Lovering, T. G.; Lakin, H. W.; Hubert, A. E.** Concentration and minor element association of gold in ore-related jasperoid samples, *in* Geological Survey research 1968, Chap. B: U.S. Geol. Survey Prof. Paper 600-B, p. B112-B114, tables, 1968.

Sixty-eight samples of jasperoid associated with base- and precious-metal ore deposits in 25 western mining districts were analyzed for gold by a method capable of detecting concentrations as low as 0.04 ppm. All these samples had been analyzed spectrographically for minor elements, and many of them had been analyzed chemically for tellurium and mercury. The gold content of these samples ranged from <0.04 to 32 ppm, with a median content of 0.2 ppm. A statistical comparison of the gold concentrations in these samples with the corresponding concentrations of 16 minor elements indicates that gold is significantly associated with tellurium, mercury, tin, arsenic, and silver.—Authors' abstract

06921 **Lovering, T. S.; Engel, Celeste.** Translocation of silica and other elements from rock into *Equisetum* and three grasses: U.S. Geol. Survey Prof. Paper 594-B, p. B1-B16, illus., tables, 1967.

Equisetum and three grass plants were planted in pots in greenhouses; crushed raw sterilized basalt, rhyolite, and quartz diorite were used as growing media. The plant ash was analyzed. The amount of silica taken into the plants was calculated to be 200 tons per acre per 5350 years—equivalent to all of the silica in 1 acre-ft of basalt. In sap from *Equisetum* the silica present was almost precisely the same as in the ash plus that in the transpired water during life. The silica occurs as part of an organic compound containing (fused?) phenyl rings with the silicon attached to a phenyl group. Magnesium probably moves into the plant as an inorganic sulfate, but most of the other cations are probably carried as parts of one or more complex organic compounds in the sap.—*from* Authors' abstract

00832 **Lowell, James David.** Discovery and exploration of the Kalamazoo orebody, San Manuel district, Arizona [abs.]: Econ. Geology, v. 63, no. 1, p. 90, 1968.

06951 **Lowenstam, H. A.** Adaptive traits in skeletal morphology, *in* AGI short course lecture notes—Paleoecology, New Orleans, La., November 1967: Washington, D.C., Am. Geol. Inst., p. HL1-HL12, illus., 1967.

The main type of morphologic feature useful in interpreting environmental conditions is adaptive traits, expressed in ecotypes. Examples described and illustrated are: the corals, *Millipora alcicornis* and *Schizoporella unicornis*; the foraminifer, *Homotrema rubrum*; the brachiopod, *Terebratalis transversa*; and the bivalve, *Mytilus galloprovincialis*. Also among the adaptive traits discussed are the attachment surfaces of epiphytes, which often replicate surface features of the substrate or species to which they were attached. The origin of carbonate mounds may be explained by bryozoa which replicate the features of sea grasses to which they were attached. The roots of disarticulated crinoids sometimes show secondary development, evidence that a major storm occurred twice during their life.—ESL

06815 **Lucchitta, Ivo.** Cenozoic geology of the upper Lake Mead area adjacent to the Grand Wash Cliffs, Arizona [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 6, p. 2483B-2484B, 1967.

Lyall, Anil K. *See* Swift, Donald J. P. 01163

01084 **Macdonald, J. A.** Lake water—A guide to uranium: Canadian Mining Jour., v. 89, no. 4, p. 89-90, 99-100, illus., 1968.

Hydrogeochemical survey indicates uranium mineralization can readiy be delineated by lake water sampling. The method is rapid and economically competitive.—ARK

06837 **Macdonald, J. R.** A new species of late Oligocene dog, *Brachyrhynchocyon sesnoni*, from South Dakota: Los Angeles County Mus. Contr. Sci., no. 126, 5 p., illus., table, 1967.

Brachyrhynchocyon sesnoni is described from the middle of the Poleslide Member of the Brule Formation in the White River Badlands of South Dakota. Although younger than the genotypic species, *B. intermedius* (Loomis) from the Orellan of Wyoming, it is not the latest record of the genus as an undescribed species has been found in the overlying Arikareean Sharps Formation.--Author's abstract

06838 **Macdonald, J. R.** A new species of late Oligocene dog, *Sunkahetanka sheffleri*, from South Dakota: Los Angeles County Mus. Contr. Sci., no. 127, 5 p., illus., table, 1967.

Sunkahetanka sheffleri is described from the Poleslide Member of the Brule Formation in the White River Badlands of South Dakota. This species is older than the genotypic species which is found in the Gering Formation (*sensu* C. B. Schultz, *et al.*) of Nebraska and in the Sharps Formation of South Dakota. It is less specialized than the later forms but does not give any greater indication of the origin of the genus.—Author's abstract

06854 **MacIntosh, J. A.** Geology of the southeast quarter of Nelligan township, Abitibi-East county [also French edition]: Quebec Dept. Nat. Resources Prelim. Rept. 568, 6 p., geol. map, 1967.

Rocks in the area, all Precambrian, are grouped into six units, each corresponding to a region on the map. Contact relationships could be observed only for a granite batholith and diabase dike. The southeast quarter of the township was prospected rather heavily in 1947–50; six of the old properties are described. Results of geochemical surveys of stream sediments are shown on the geologic map accompanying the report.—ESL

MacKenzie, W. Bruce. *See* Wallace, Stewart R. 00836

00961 **MacLaren, A. S.** Aeromagnetic interpretation, *in* A preliminary study of the Moose River belt, northern Ontario: Canada Geol. Survey Paper 67-38, p. 7-11, illus., 1968.

The principal feature on the aeromagnetic map of this area is the Moose River belt of anomalies extending 160 mi south-southwest from James Bay; it cuts across the typical east-west magnetic trends and lies on the east flank of a gravity high. It is suggested that a long narrow lineament in the center of the belt is the locus of a strong major fault, and that granulites corresponding to the belt have been brought to the surface by faulting bounding it. Carbonatite dikes occur along faults on the Kapuskasing gravity high, resembling the association of carbonatites and gravity anomalies with diabase dikes and kimberlites in Tanganyika.—ESL

06842 **MacPherson, Joyce Brown.** Raised shorelines and drainage evolution in the Montréal lowland: Cahiers Géographie Québec, v. 11, no. 23, p. 343-360, illus., tables, 1967.

During the final stages of the glacial maximum, the Montreal lowland was inundated by the Champlain Sea. The sea was at its maximum about 11,400 years ago; since then, the lowland has re-emerged by isostatic recovery and a new drainage pattern has been established upon the veneer of glacial, marine, and other superficial deposits. Thus, although the broad outlines of the lowland were shaped before the invasion of the Pleistocene ice, the Saint Lawrence River and its tributaries form in detail one of the most youthful of the world's drainage systems.—*from* Author's introduction

06944 **Major, Robert L.** Mineral resources and mineral industries of the western Illinois region: Illinois Geol. Survey Mineral Economics Brief 19, 35 p., illus., tables, 1967.

The region includes the 13 counties of the central western portion of Illinois Adams, Brown, Calhoun, Fulton, Hancock, Henderson, Henry, Knox, McDonough, Mercer, Pike, Schuyler, and Warren. Value of mineral production in 1965 was 56 million dollars. Minerals and mineral products produced were coal, clay products, lime, crushed and broken stone, gravel, sand, and crude oil. Undeveloped resources are oil shale, feldspar-bearing sands, and pyrite. Processing facilities consist of two lime plants and two small oil refineries.—*from* Author's abstract

06945 **Major, Robert L.** Mineral resources and mineral industries of the northwestern Illinois region: Illinois Geol. Survey Mineral Economics Brief 20, 25 p., illus., tables, 1967.

The region includes the 10 counties of the northwestern corner of Illinois—Boone, Carroll, DeKalb, Jo Daviess, Lee, Ogle, Rock Island, Stephenson, Whiteside, and Winnebago. Value of mineral production in 1966 was 21.1 million dollars. Mineral products are cement, crushed and broken stone, sand and gravel, natural bonded molding sand, zinc, lead, and silica sand; other mineral materials include oil shale and feldspar-bearing sand. Processing facilities are located and described.—*from* Author's abstract

00775 **Mallory, Edward C., Jr.** Spectrochemical analysis of stream waters in geochemical prospecting, north-central Colorado, *in* Geological Survey research 196, Chap. B: U.S. Geol. Survey Prof. Paper 600-B, p. B115-B116, illus., 1968.

A combined chemical concentration–spectrographic analysis method was used to determine variations in the molybdenum, lead, and zinc concentrations in Clear Creek and its tributaries, which drain known mineralized areas. The variations in concentration correlated closely with the location of the mineralized areas, and the data indicate that this method can be used for rapidly scanning large areas for the presence of mineral concentrations.—Author's abstract

Mamet, B. *See* Toomey, Donald Francis. 00817

06889 **Mann, C. John.** Spectral-density analysis of stratigraphic data, *in* Computer applications in the earth sciences—Colloquium on time-series analysis: Kansas Geol. Survey Computer Contr. 18, p. 41–45, illus., 1967.

Numerically coded data on lithology, color, bedding, and thickness for two stratigraphic sections of Missourian (Pennsylvanian) rocks [Arizona and Utah] were analyzed by spectral densities. Geological assumptions required that deposition was continuous and at a uniform rate for 4.14 million years throughout the sequence. Although noise level is high for the analysis of stratigraphic data, periodicities of 109,000; 30,800; and 24,250 years may be interpreted from the spectral density.—Author's abstract

Marczynski, Louis F. *See* Hingorani, Gangu G. 06887

Marsh, Sherman P. *See* Sheridan, Douglas M. 01142

Marshall, Raymond L. *See* Olson, Gerald W. 01058

06919 **Martin, H. L.** Mississippian subsurface geology in the Pembina area, Alberta: Canada Geol. Survey Paper 66–22, 14 p., illus., table, 1967.

Mississippian rocks in this area, 1,000 feet thick in the west, are eroded eastward so that progressively older formations underlie the sub–Mesozoic unconformity from west to east. Hydrocarbons are trapped in porous carbonate rocks at the erosional edges in the Brazeau River, Minnehik–Buck Lake, and Wilson Creek gas fields. Mississippian rocks disconformably overlie Late Devonian limestones. Above the basal black radioactive Exshaw shale is the Banff Formation of three units. Between the Banff and Shunda Formations is a low paleotopographic ridge of Pekisko bioclastic limestones and dolomites. The Shunda has an eastern breccia facies, and western anhydritic carbonate. Uppermost, the porous dolomites of the Elkton Member of the Turner Valley Formation produce gas in the Brazeau River field. Structure contour and isopach maps, and cross sections are in pocket.—GDC

Massoni, C. J. *See* Shapiro, Leonard. 00779

06888 **Matalas, N. C.** Some distribution problems in time-series simulation, *in* Computer applications in the earth sciences—Colloquium on time-series analysis: Kansas Geol. Survey Computer Contr. 18, p. 37–40, 1967.

To generate synthetic sequences by means of a first-order Markov process, the probability distribution of the random component, ϵ, in the process must be considered in terms of the form of resemblance that is desired between the historical and synthetic sequences. For resemblance in terms of moments of order $m \leq 3$, no special difficulties are encountered. If the historical events are assumed to follow a particular probability distribution, then the probability distribution of ϵ is uniquely defined and this may give rise to difficulties in generating synthetic sequences. Author's abstract

06821 **Matsch, Charles L.; Wright, Herbert E. Jr.** The southern outlet of Lake Agassiz, *in* Life, land and water—Conference on environmental studies of the Glacial Lake Agassiz region, 1966, Proc.: Manitoba Univ. Dept. Anthropology Occasional Paper 1, p. 121–140, illus., 1967.

The drainage channel for the Lake Agassiz overflow to the south occurred prior to the existence of Agassiz. Lake Benson was drained by this channel earlier in the Wisconsin Stage. The outlet is in South Dakota and the channel trends

southeastward through Minnesota. Details of the route, and the relation of lake overflow to the various stages of the lake, and the various channels occupied, are outlined. The incision by the river through the moraine resulted in the accumulation of a pavement of granite boulders; this pavement prevented further downcutting, and the well-known Agassiz strandlines resulted from the stability. The strandlines and the outlet were abandoned when the northward retreat of the ice opened different, lower outlets to the north and east.—HRC

Mattick, R. E. *See* Arnow, Ted. 00791

01030 **Mattox, Richard B.** Upheaval Dome, a possible salt dome in the Paradox Basin, Utah, *in* Saline deposits—Internat. Conf. Saline Deposits, Houston, Tex., 1962, Symposium: Geol. Soc. America Spec. Paper 88, p. 331–347, illus., table, 1968.

Upheaval Dome is a breached structure that is surrounded by a well-developed rim syncline. Strata from Permian to Jurassic are exposed and all are deformed. About 3,000 feet of Pennsylvanian salt underlie the dome. The origin has not been established but various hypotheses are reviewed. The author suggests that the dome is a product of salt flowage resulting from differential pressures which were produced by differential compaction of the sediments over and on the flanks of a buried hill, or monadnock, on the Precambrian basement complex.—*from* Author's abstract

01040 **Mattox, Richard B.** Salt anticline field area, Paradox Basin, Colorado and Utah, *in* Saline deposits—Internat. Conf. Saline Deposits, Houston, Tex., 1962, Symposium: Geol. Soc. America Spec. Paper 88, p. 5–16, illus., 1968.

A general geological description of the area is given as a background for a field trip. Canyons, salt anticlines, LaSal and Abajo Mountains, other minor physiographic features, and the stratigraphic section are described cursorily. Rocks from Cambrian to Cretaceous age are discussed briefly; the Pennsylvanian rocks contain much salt. Faults, salt-cored anticlines, salt domes, and well-developed joint systems are present. Petroleum and potash salts are the main mineral resources at the present time.—HRC

01119 **Mattox, Richard B.; Holser, W. T.; Odé, Helmer; McIntire, W. L.; Short, N. M.; Taylor, R. E.; VanSiclen, D. C.** (editors). Saline deposits—A symposium based on papers from the International Conference on Saline Deposits, Houston,Texas, 1962: Geol. Soc. America Spec. Paper 88, 701 p., illus., tables, 1968.

This volume contains 35 articles divided into five general categories: (1) field areas, (2) stratigraphy and structural geology of salt deposits, (3) geochemistry, (4) physical properties of salt, and (5) work session reports. Each paper, where applicable, is cited separately by author.—HRC

06829 **Mayer-Oakes, William J.** Prehistoric human population history of the Glacial Lake Agassiz region, *in* Life, land and water—Conference on environmental studies of the Glacial Lake Agassiz region, 1966, Proc.: Manitoba Univ. Dept. Anthropology Occasional Paper 1, p. 339–377, illus., tables, 1967.

In this paper an attempt is made to provide a general outline of the pre-European human population history of the Glacial Lake Agassiz region. The outline stresses results of research activity in archeology as well as the history of archeological work in Manitoba. Manitoba is emphasized rather than the Glacial Lake Agassiz region not only because of space limitations, but also because of the fact that there is not much information from the pertinent parts of Saskatchewan, Ontario, and other surrounding areas.—*from* Author's introduction

06841 **Mayer-Oakes, William J.** (editor). Life, land and water—Conference on environmental studies of the Glacial Lake Agassiz region, 1966, Proc.: Manitoba Univ. Dept. Anthropology Occasional Paper 1, 414 p., illus., tables, 1967.

This symposium contains twenty papers grouped in five parts: the 1966 National Research Council Conference, man in his environment, Glacial Lake Agassiz, paleoecology of Glacial Lake Agassiz, and human population history of Glacial Lake Agassiz. Papers pertaining to geology are cited separately.—HRC

McAdoo, G. D. *See* Anders, R. B. 00815

06831 **McAndrews, John H.** Paleoecology of the Seminary and Mirror Pool peat deposits, *in* Life, land and water—Conference on environmental studies of the Glacial Lake Agassiz region, 1966, Proc.: Manitoba Univ. Dept. Anthropology Occasional Paper 1, p. 253–269, illus., tables, 1967.

Pollen analyses show that the Lake Agassiz I–II subaerial stage occurred during the late glacial vegetational period; upland sites had boreal forests. The change to postglacial vegetation occurred about 9,000 years ago. Wood and peat has been radiocarbon dated. The southern basin was not generally forested during late glacial I–II stages nor during early postglacial. It is possible that the area assumed a modern vegetational aspect about 7,000 to 9,000 years ago.—*from* Author's conclusions

06904 **McAndrews, John H.** Pollen analysis and vegetational history of the Itasca region, Minnesota, *in* Quaternary paleoecology—Internat. Assoc. Quaternary Research, 7th Cong., 1965, Proc., V. 7: New Haven, Conn., Yale Univ. Press, p. 219–236, illus., table, 1967.

The postglacial vegetation history was reconstructed with the aid of pollen diagrams from four pond sites. From 12- to 11,000 years ago, boreal forest prevailed; then trees were replaced by prairie in the west and remained until settlement. The vegetation of the coarser-textured soils to the east became dominated by pine. About 8,500 years ago on the less coarse soils pine was replaced by oak savannah, and this, 4,000 years ago, was succeeded by deciduous forest which persisted until settlement. White pine came upon the eastern coarse-textured soils about 2,000 years ago, and 1,000 years ago was joined by jack and Norway pine, together with hardwoods, all of which form the present-day forests in the area.—*from* Author's abstract

00870 **McCamy, Keith.** An investigation and application of the crustal transfer ratio as a diagnostic for explosion seismology [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 7, p. 2910B, 1968.

01159 **McDaniel, Gary A.** Find strattrap oil with paleocurrents: Oil and Gas Jour., v. 66, no. 20, p. 122–124, 126, 128–129, illus., 1968.

A paleogeographic map of the Lower Hartshorne Sandstone in central Pittsburg County, Okla., explains the distribution of the gas. The gas (100+ billion cu ft) is in a distributary channel that is about one mile wide and trends northeast southwest for at least 13 miles. The distributary channel is in the bottom of a present day structural low. Construction of a paleographic map is discussed.—BRH

01101 **McElhinny, M. W.; Briden, J. C.; Jones, D. L.; Brock, A.** Geological and geophysical implications of paleomagnetic results from Africa: Rev. Geophysics, v. 6, no. 2, p. 201–238, illus., tables, 1968.

A part of the study compares African data with that for the Canadian Shield for the period 2,000 to 1,200 m.y. and suggests tentatively that the Canadian and Southern African cratons did not move relative to each other during that time. This is the first attempt at reconstruction of the relative positions of two continental regions from Precambrian paleomagnetic data.—ESL

01106 **McIntire, W. L.** Effect of temperature on the partition of rubidium between sylvite crystals and aqueous solutions, *in* Saline deposits—Internat. Conf. Saline Deposits, Houston, Tex., 1962, Symposium: Geol. Soc. America Spec. Paper 88, p. 505–524, illus., tables, 1968.

Sea water contains about 0.12 ppm Rb, most of which is in K minerals in evaporites. The amount of Rb in a mineral depends upon the partition coefficient, $D=(Rb/K)_s/(Rb/K)_L$, the Rb/J ratio in sylvite to that of sea water. Results of six different temperatures from 0° to 100°C show that D is related to temperature by the equation, $D=0.277-0.8168(10^4/T°K)\pm0.001$. The effects of occluded mother liquor on D was also investigated. Normally, KCl is cubic and tends to be cloudy due to liquid occlusions. If a small amount of Bi is added, crystals develop octahedra

and are clear. A comparison of D with and without Bi at 40°C showed no essential difference. It is concluded that the amount of liquid occlusion in sylvite is insufficient to affect the value of D significantly.—*from* Author's abstract

McIntire, W. L. *See* Mattox, Richard B. 01119

01066 **McIntyre, D. S.; Loveday, J.** Problems of determination of soil density and moisture properties from natural clods: Soil Sci., v. 105, no. 4, p. 232–236, illus., table, 1968.

From the results given, and from the general principles and experience, certain recommendations are made for sampling soils for physical measurements. The techniques employed for these measurements are outlined.—JWH

01069 **McKee, E. H.** Age and rate of movement of the northern part of the Death Valley–Furnace Creek fault zone, California: Geol. Soc. America Bull., v. 79, no. 4, p. 509–512, illus., table, 1968.

Large right-lateral displacements along the Death Valley–Furnace Creek fault zone have probably taken place since Middle Jurassic time. Matching of Middle Jurassic granitic rocks (160 m.y. old by K–Ar dating) on either side of the fault zone suggests displacement on the order of 30 miles. The distribution of Pliocene sedimentary rocks (3.5 m.y. old by K–Ar dating) in the same region suggests the possibility of approximately 3,000 feet of right-lateral movement since Pliocene time. The calculated rate of displacement since the Middle Jurassic is similar to the tentative rate since the late Pliocene: 30 mi in 160 m.y. = 0.6 mi in 3.5 m.y.—Author's abstract

McKee, Edwin H. *See* Stewart, John H. 00911

06871 **McKnight, Edwin T.** Bearing of isotopic composition of contained lead on the genesis of Mississippi Valley ore deposits, *in* Genesis of stratiform lead–zinc–barite–fluorite deposits (Mississippi Valley type deposits)—A symposium, New York, 1966: Econ. Geology Mon. 3, p. 392–398, table, 1967.

Lead isotope ratio anomalies in Mississippi Valley deposits consist of an excess of Pb–206 and Pb–208 in comparison to ordinary lead. This suggests that isotopic evolution of lead was modified by a variation in geologic history that permitted evolution for a long period in an environment richer in uranium and thorium than in ordinary lead. The hypothesis is presented that this special environment was the Precambrian granites of the Central craton, and that remobilization was an igneous phenomenon closely tied to evolution of the alkaline and particularly potassic igneous rocks.—*from* Author's abstract

McLean, G. W. *See* Eaton, Frank M. 01067

00893 **McLemore, William H.** "Cold intrusion" of ultra-basic bodies at the Pollard's Corner area, Columbia County, Georgia [abs.]: Georgia Acad. Sci. Bull., v. 26, no. 2, p. 69, 1968.

01086 **McMahon, Beverly E.; Strangway, David W.** Stratigraphic implications of paleomagnetic data from upper Paleozoic–Lower Triassic redbeds of Colorado: Geol. Soc. America Bull., v. 79, no. 4, p. 417–427, illus., tables, 1968.

Paleomagnetic examination of the Upper Pennsylvanian, Permian, and Lower Triassic redbed sequence in Colorado has located the stratigraphic position of the Kiaman magnetic division. The approximate levels of the base and top of the division are on the western slope of the southern Rocky Mountains, separated by 4,000 feet of stratigraphic section. The base of the division seems to be Des Moinesian (Upper Pennsylvanian), and the top, Lower Scythian (Lower Triassic). On the eastern slope of the Rocky Mountains all samples that were measured magnetically have reversed directions, and this suggests that the entire stratigraphic section examined, which includes the Fountain and Lykins formations and the Lyons Sandstone, belongs to the Kiaman magnetic division.—*from* Author's abstract

00927 **McMaster, Robert L.; LaChance, Thomas P.; Garrison, Louis E.** Seismic reflection studies in Block Island and Rhode Island Sounds: Am. Assoc. Petroleum Geologists Bull., v. 52, no. 3, p. 465–474, illus., 1968.

Continuous seismic-reflection profiles reveal a south-southeast-dipping Fall Zone surface on which deposits of probable Late Cretaceous age occur. A distinct cuesta and inner lowland, which mark the inshore edge of these deposits, are traceable across the sounds between Long Island and the Martha's Vineyard area. Post-Cretaceous erosion cycles produced a well-defined drainage system on the Fall Zone surface and coastal plain formations. The locations of many of the linear depressions on the present bottom surface of the sounds are closely related to these post Cretaceous valleys. Glacial events have had a minimal effect on this inner shelf although locally thick Pleistocene deposits may be present in the inner lowland. Finally, thin accumulations of post-glacial sediments overlie a distinctive erosion surface of late Wisconsin or early Holocene age.—*from* Authors' abstract

00989 **McNeal, Brian L.** Limitations of quantitative soil clay mineralogy: Soil Sci. Soc. America Proc., v. 32, no. 1, p. 119–121, tables, 1968.

Analysis of the effects of varying the parameters assigned to soil mineral species for the purpose of quantitative mineralogical analysis suggests that absolute determination of mineral contents may be precluded by the variations in soil mineral properties which can be reasonably expected to occur. Rejection of those variations that produce unreasonable results for specific groups of soils, however, verifies that estimation of sample mineral contents for these soils is often valid to within ±5 percent.—Author's abstract

McVay, T. L. *See* Hollenbeck, R. P. 06922

00811 **Meade, Robert H.** Compaction of sediments underlying areas of land subsidence in central California: U.S. Geol. Survey Prof. Paper 497-D, p. D1–D39, illus., tables, 1968.

An increase in effective overburden load from 3 to 70 kg per sq cm, partly natural and partly man-made, has caused an average reduction of 10 to 15 percent in the volume of alluvial sediments in the San Joaquin and Santa Clara Valleys. Many factors affect pore volume, particle size and sorting being the most easily discernable. A multiple regression analysis of the pore volume, overburden load, and selected petrologic characters of a group of 20 fine alluvial and shallow marine sediments shows pore volume to be most closely related to particle size, diatom content, and adsorbed sodium by clay minerals; other factors are described also. The only compaction effects observed in sand are distorted and broken fragments of mica, shale, and metamorphic rock.—*from* Author's abstract

01031 **Mear, Charles E.** Upper Permian sediments in southeastern Permian Basin, Texas, *in* Saline deposits—Internat. Conf. Saline Deposits, Houston, Tex., 1962, Symposium: Geol. Soc. America Spec. Paper 88, p. 349–358, illus., 1968.

In the Late Permian, dolomite and sand were deposited during Grayburg time, and were followed by anhydrite and halite in early Queen time. Clastic material was added to the evaporites during Queen and Seven Rivers times. During Yates time, 150 feet of sand was spread across the area, followed by evaporite deposition during Tansill time. Regional uplift followed, and 20 feet of Castile(?) shale were deposited. These were followed by more evaporite deposition. Local emergence and erosion followed, and the final transgression of the Permian sea resulted in the deposition of 80 feet of the Rustler Formation, which includes anhydrite, and finally 100 feet of Dewey Lake sand was deposited.—HRC

06931 **Medlin, Jack H.; Hurst, Vernon J.** Geology and mineral resources of the Bethesda Church area, Greene County, Georgia: Georgia Geol. Survey Inf. Circ. 35, 29 p., illus., tables, geol. map, 1967.

Detailed field work and petrographic study (105 thin sections) were carried out in this area, on the east flank of the Precambrian metamorphic belt, to interpret the metamorphic history and origin of the rocks. Principal rock types are amphibolite

(three types, including metamorphosed gabbro) and hornblende gneiss, with lesser biotite gneiss, schist, metapyroxenite, quartzite, and granite. The rocks were first metamorphosed to the amphibolite facies, with foliation and folding. Gabbro and pyroxenite were then intruded. Cataclasis and shearing, followed by hydrothermal alteration, took place during the second metamorphism. Slightly metamorphosed cross-cutting rhyolite dikes were emplaced in the waning stages of the second metamorphism; diabase dikes are post-metamorphic. Saprolite mineralogy is distinct for each rock type. Possibly economic deposits of feldspar, iron, mica, quartz, and gold are present.—VMJ

01156 **Meeves, Henry C.; Darnell, Richard P.** Study of the silver potential, Creede district, Mineral County, Colorado: U.S. Bur. Mines Inf. Circ. 8370, 58 p., illus., tables, 1968.

Silver reserves of the Creede district are estimated to be about 22 million oz; approximately 11 million oz are in minable ore, and the remainder is submarginal under 1966 conditions. Recently production has averaged about 240,000 oz of silver per year but stimulated by a rise in the price of silver may reach 1 million oz annually by 1969, mostly from the zone of secondary enrichment. When ore in this zone is depleted, silver production will decline and return to a level dependent chiefly on rate of mining lead and zinc from primary sulfide ores. A number of mines are described briefly, and mining and milling methods and costs are discussed.—CSB

06953 **Mehringer, Peter J., Jr.** The environment of extinction of the Late-Pleistocene megafauna in the arid southwestern United States, *in* Pleistocene extinctions—The search for a cause—Internat. Assoc. Quaternary Research, 7th Cong., 1965, Proc., V. 6: New Haven, Conn., Yale Univ. Press, p. 247-266, illus., table, 1967.

The modern habitats of the west were occupied by late-Pleistocene megafauna. The arid regions were less widespread, even after the big extinction of 10,000 years ago. About 12,000 years ago, many marginal habitats but no migration barriers occurred. If climate were a major factor, the ice age should have been detrimental; the deglaciation should have resulted in expansion of populations, not demise. Herbivore habitats are more widespread now than during the glacial epochs; there should be a bigger biomass of herbivores now. Because different species of the extinct Late-Pleistocene megafauna occupied habitats ranging from warm semi-arid to periglacial, it seems unlikely that a single climatic cause alone is responsible for extinction.—*from* Author's abstract

Meyer, Robert P. *See* Lewis, Brian T. 00956

Meyer, Walter R. *See* Prill, Robert C. 00734

01161 **Meyerhoff, A. A.** Future hydrocarbon provinces of the Gulf of Mexico-Caribbean region—Pt. 1, "Explored" areas still hold future hydrocarbon potential: Oil and Gas Jour., v. 66, no. 24, p. 146-151, illus., 1968.

Throughout the Gulf of Mexico-Caribbean region, the known facts regarding the pre-Pennsylvanian indicate that this part of the section has little or no hydrocarbon potential. In contrast, the Pennsylvanian and Permian may be attractive targets for the drill along the Gulf of Mexico side of the Ouachita belt, from Mississippi to northeastern Mexico. Equivalent strata should be drilling objectives in the foreland area north of the northern Central American orogen. In the northern Andean orthogeosyncline area, however, the "younger Paleozoic," wherever observed, is too highly deformed to be considered as an exploratory target. Author's conclusions

00883 **Midgett, Gordon M.** Recent site profiles in the Broad River-Pistol Creek drainage of northeast Georgia [abs.]: Georgia Acad. Sci. Bull., v. 26, no. 2, p. 75, 1968.

Miller, Fred P. *See* Wilding, L. P. 01063

01132 **Miller, George J.** On the age distribution of *Smilodon californicus* Bovard from Rancho La Brea: Los Angeles County Mus. Contr. Sci., no. 131, 17 p., illus., tables, 1968.

Over 2,100 skulls of *Smilodon* from the Los Angeles County Museum collection are studied to determine percentages of age groups trapped in the La Brea Pits. The specimens are arbitrarily classified in four age groups, by tooth wear and closure of the basioccipital–basisphenoid suture. Percentages are: 16.6 percent juveniles, 23.2 percent young adults, 17.2 percent adults, 8.5 percent aged, with 34.5 percent undetermined. As the large number of undetermined are mostly adults that could not be positively classified in the three older groups, the specimens are then classified with the aged category eliminated: 16.6 percent juveniles, 25.7 percent young adults, 56.5 percent adults, 1.2 percent undetermined. These data show that a cross section of the population, rather than a preponderance of any one age group, was trapped in the pits.—*from* Author's abstract

01065 **Miller, Raymond J.** Electron micrographs of acid–edge attack of kaolinite: Soil Sci., v. 105, no. 3, p. 166–171, illus., table, 1968.

Electron micrographs of kaolinite particles heated at 105°C with 3.6N HCl for various times suggest that the attack by acid is primarily an edge attack and that it proceeds from the edges inward. The micrographs show that silica skeletons remain as the octahedral cations are removed and that these skeletons can be quite stable.—JWH

00854 **Milliman, John Douglas.** The marine geology of Hogsty Reef—A Bahamian atoll [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 7, p. 2901B–2902B, 1968.

00798 **Milton, Charles; Bennison, Allan P.** Phosphate nodules from the Wills Point Formation, Hopkins County, Texas, *in* Geological Survey research 1968, Chap. B: U.S. Geol. Survey Prof. Paper 600–B, p. B11–B15, illus., tables, 1968.

Phosphate nodules, several centimeters in size, generally rounded, consisting principally of carbonate–fluorapatite with calcite (mostly foraminiferal tests) and glauconite and very minor quartz, occur in glauconitic clay in the basal part of the Wills Point Formation (upper part of Midway Group) of Paleocene age in Hopkins County, Tex. The nodules are a stratigraphic marker of an angular unconformity, and occur along the Mexia–Talco fault zone from Limestone County to Hopkins County in northeast Texas, a distance of about 100 miles. A chemical analysis of the nodules and an X–ray powder pattern are given, and the petrography of the nodules is described and illustrated.—Authors' abstract

00834 **Mitcham, Thomas W.** Economic geology research [abs.]: Econ. Geology, v. 63, no. 1, p. 88, 1968.

Miyano, Kei. *See* Pessagno, Emile A., Jr. 00908

00945 **Mock, Steven J.** Snow accumulation studies on the Thule Peninsula, Greenland: U.S. Army Materiel Command Cold Regions Research and Eng. Lab. Research Rept. 238, 22 p., illus., tables, 1968.

Data from stake measurements, marker boards, and pits along a 136–km trail crossing Thule Peninsula have been used to determine regional and local distribution of snow accumulation. Trend surfaces of mean annual accumulation can be predicted regionally from a model using distance from moisture source and elevation as parameters. A series of steplike features breaks the smooth profile of the ice sheet and causes changes in accumulation rates on a local scale; the accumulation pattern can be predicted from surface slope and departure from regional elevation. Profiles of surface and subsurface topography indicate a direct relation between subsurface hills and steplike features but cannot be quantitatively accounted for by ice flow theory. Detailed studies near Camp Century revealed development of a shallow valleylike feature, where accumulation rates have increased, indicating that it is the result of flow phenomena.—*from* Author's summary

Molnar, Peter H. *See* Page, Robert A. 00963

01071 **Monroe, Watson H.** The age of the Puerto Rico Trench: Geol. Soc. America Bull., v. 79, no. 4, p. 487–493, illus., 1968.

The trench is parallel to and north of Puerto Rico and the Virgin Islands, and is more than 8,000 m deep. Puerto Rico has a longitudinal core of Cretaceous and early Tertiary volcanic rocks, numerous small granitic intrusions of similar age, and serpentinite of undetermined age. These rocks were folded and intensely faulted during Late Cretaceous to middle Eocene time. Fold and fault zone trends are west-northwest, about 15° to the trend of the trench. Late Oligocene sedimentary rocks rest unconformably on these rocks and, together with Miocene sedimentary rocks, strike to the east, parallel to the trench. Thus, the trench probably appeared in Oligocene or possibly late Eocene time. It may have reached its maximum depth in late Miocene or Pliocene time.—RAL

Moore, James G. *See* Dodge, F. C. W. 00797

00874 **Morelock, Jack.** Sedimentation and mass physical properties of marine sediments, western Gulf of Mexico [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 7, p. 2975B–2976B, 1968.

00855 **Morgan, Bill Eugene.** Palynology of a portion of the El Reno Group (Permian) southwest Oklahoma [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 7, p. 2902B, 1968.

Mortland, M. M. *See* Lai, T. M. 00901

01054 **Moss, Marshall E.** Riverbed degradation below dams—Discussion [of paper 5335 by S. Komura and D. B. Simons, 1967]: Am. Soc. Civil Engineers Proc., v. 94, paper 5920, Jour. Hydraulics Div., no. HY3, p. 757–759, table, 1968.

It seems to the writer that the keys to evaluating this paper (ibid., v. 93, no. HY4, p. 1–14, 1967) lie in the ability to determine the value of the critical friction velocity and to modify it to take into account turbulence effects on the sediment transport rates. Critical friction velocity remains an unquantified parameter, and because of this and the apparent lack of applicability of the Brown equation, extensive field measurements will be required to verify the procedure presented.—ESL

01074 **Motts, Ward S.** The control of ground-water occurrence by lithofacies in the Guadalupian reef complex near Carlsbad, New Mexico: Geol. Soc. America Bull., v. 79, no. 3, p. 283–297, illus., geol. map, 1968.

Major Guadalupian lithofacies which affect water occurrence are: (1) a basin facies of very low permeability which confines ground water, (2) a reef-zone facies of very high permeability, (3) a shelf-carbonate facies ranging from very high permeability near the reef zone to low permeability near the shelf-evaporite facies, and (4) a shelf-evaporite facies of moderate permeability. A zone of exceedingly high permeability, extending from the reef-zone facies into the calcareous subfacies of shelf-carbonates, forms the Limestone aquifer, and a zone of much lower permeability, occupying most of the shelf-carbonate and shelf-evaporite facies, forms the Shelf aquifers. The circulation of water through the Limestone aquifer has caused extensive solution and caverns, of which Carlsbad Caverns are a part.—*from* Author's abstract

00777 **Mountjoy, Wayne; Wahlberg, James S.** Determination of micro amounts of cesium in geologic materials, *in* Geological Survey research 1968, Chap. B: U.S. Geol. Survey Prof. Paper 600-B, p. B119–B122, tables, 1968.

Cesium is concentrated from solutions of rock samples by ion-exchange onto ammonium molybdophosphate (AMP). Either X-ray fluorescence or atomic absorption spectrophotometry is used for the determination. Standard reference samples containing cesium in the range from about 1 to 10 ppm were analyzed and show good agreement with published results. The sensitivity for both methods is about 0.3 ppm on a 2-g sample.—Authors' abstract

01087 **Mudge, Melville R.** Depth control of some concordant intrusions: Geol. Soc. America Bull., v. 79, no. 3, p. 315–332, illus., table, 1968.

Analysis of geologic data from 54 localities, mainly in the western United States, shows that concordant igneous masses intruded zones in nearly flat-lying sedimentary rocks where the thickness of cover was 3,000 to 7,500 feet. Most bodies intruded along well-defined bedding planes in sedimentary rocks and flow surfaces in extrusive igneous rocks; some intruded along unconformities. The range in overburden pressure is about 3,000 to 7,500 psi for intrusions at depths of 3,000 to 7,500 feet. Magma pressure for lateral injection at the lower limit of the depth range, therefore, must have exceeded 7,500 psi. A fluid barrier, such as a shale, overlies almost all intrusions studied and tended to retard upward advance of magma.—*from* Author's abstract

01104 **Muehlberger, William R.** Internal structures and mode of uplift of Texas and Louisiana salt domes, *in* Saline deposits—Internat. Conf. Saline Deposits, Houston, Tex., 1962, Symposium: Geol. Soc. America Spec. Paper 88, p. 359–364, illus., 1968.

Maps of layering visible in salt mines show patterns of shear and flow folds; the layering is believed to be original bedding. Petrofabric studies in the Grand Saline Dome demonstrate that the motion was steeply upward and essentially parallel to the fold axes. Halite shows cubic as well as dodecahedral glide planes. The domes rose to their present positions as a series of separate elements (spines, pencils, etc.) rather than as single large entities. This theory of differential uplift has been corroborated from structural mapping in sedimentary rocks surrounding the dome.—*from* Author's abstract

06903 **Murphy, Michael A.** Aptian and Albian Tetragonitidae (Ammonoidea) from northern California: California Univ. Pubs. Geol. Sci., v. 70, 43 p., illus., 1967.

The Aptian and Albian strata of California may be characterized and subdivided on the basis of members of the Family Tetragonitidae. The *wintunius* zone (upper Aptian) and the *lecontei* and *hulenense* zones (lower Albian) are especially characterized by abundant and short-ranging species of the family. A problem created by the citation of two holotypes for *Gabbioceras wintunium* Anderson, which obviously belong to different species, necessitated a review of the entire family. The taxonomic position of the genera *Eogaudryceras*, *Anagaudryceras*, *Gabbioceras*, and *Eotetragonites* is reviewed and detailed morphologic descriptions of several species are presented. These taxa all are retained at the generic level. One new species, *Eotetragonites shoupi*, is described from the middle *wintunius* zone.—DCR

00781 **Myers, Donald A.** *Schwagerina crassitectoria* Dunbar and Skinner, 1937, a fusulinid from the upper part of the Wichita Group, lower Permian, Coleman County, Texas, *in* Geological Survey research 1968, Chap. B: U.S. Geol. Survey Prof. Paper 600-B, p. B133–B139, illus., 1968.

Specimens of *Schwagerina crassitectoria* Dunbar and Skinner, 1937, described in this report, were collected from the Talpa Limestone Member of the Clyde Formation (middle Permian) in north-central Texas. These forms are similar to the intergradational species of *S. crassitectoria* and *S. guembeli* from the Hess Formation, of early Leonard age, in the Glass Mountains, west Texas.—Author's abstract

00946 **Nace, Raymond L.** Geohydrology—Recent progress: Geotimes, v. 13, no. 4, p. 16, 1968.

Current emphasis on total hydrological systems is on processes in recharge of ground water and movement of water in and among aquifers. Laboratory experiments confirm local miniscal film flows, but actual transfer of liquid is by bulk flow in silt and coarser materials. Darcy's law is valid in many saturated natural sediments, excepting extremely fine clays and situations where waters of differing composition are separated by confining beds. A new equation for nonsteady radial flow treats transmissivity as a tensor. Only a few wells drilled in the United States have been logged by modern geophysical methods, although the basis for 3-dimensional system

modeling could thus be improved. A new manual on aerial exploration contains a section on photohydrology, radionuclides as water tracers have been successful for some purposes, and underground injection of air to block migration of saline water and of radioactive waste is under study.—GDC

00778 **Nakagawa, H. M.; Thompson, C. E.** Atomic absorption determination of tellurium, *in* Geological Survey research 1968, Chap. B: U.S. Geol. Survey Prof. Paper 600-B, p. B123-B125, tables, 1968.

Tellurium in soils and rocks is solubilized by treatment of the sample with hydrobromic acid-bromine mixture, selectively extracted into methyl isobutyl ketone, and finally measured by atomic absorption spectrophotometry applied to the separated ketone. As little as 0.1 ppm of tellurium can be detected, and amounts of 0.2 ppm or more can be measured with an accuracy comparable to that for an existing catalytic procedure.—Authors' abstract

Nakagawa, H. M. *See* Thompson, C. E. 00780

00830 **Nash, J. T.; Kerr, P. F.** Uranium deposits in the Jackpile Sandstone, New Mexico [abs.]: Econ. Geology, v. 63, no. 1, p. 88-89, 1968.

06885 **Neidell, Norman S.** Frequency analysis for sparse and badly sampled data in the earth sciences, *in* Computer applications in the earth sciences—Colloquium on time-series analysis: Kansas Geol. Survey Computer Contr. 18, p. 15-17, tables, 1967.

Cyclicities, periodicities, and oscillatory transients of long-time duration are ubiquitous characteristics of many earth-science studies. Frequency analysis methods date from Fourier in 1822; currently popular power-spectral methods can improve the reliability of calculated amplitudes but sacrifice frequency resolution. Nonlinear estimation and differential modeling are alternate methods discussed in this paper; appropriately used, both methods attain a degree of amplitude and frequency resolution which cannot be matched by conventional analysis. Results obtained for a synthetic example of periodogram analysis (Bellman and Kalaba, 1965) indicate that these alternate methods merit further attention, especially when treating sparse and badly sampled data.—GDC

00799 **Nelson, Arthur E.** Intrusive rocks of north-central Puerto Rico, *in* Geological Survey research 1968, Chap. B: U.S. Geol. Survey Prof. Paper 600-B, p. B16-B20, illus., tables, 1968.

In north-central Puerto Rico, Late Cretaceous to early Tertiary intrusive rocks, which range from gabbro to granodiorite, cut chemically similar Albian to Maestrichtian volcanic rocks. The chemical affinities between the two kinds of igneous rocks present suggest that this area is part of a calc-alkalic igneous terrane.—Author's abstract

06902 **Nelson, D. J.** Microchemical constituents in contemporary and pre-Columbian clamshell, *in* Quaternary paleoecology—Internat. Assoc. Quaternary Research, 7th Cong., 1965, Proc., V. 7: New Haven, Conn., Yale Univ. Press, p. 185-204, illus., tables, 1967.

A heterogeneous distribution of strontium, barium, and manganese within eight species of freshwater clam shells is related to annual growth and shell structure. Sodium and magnesium are relatively constant throughout the shells. There are inherent differences in the trace-element composition of the clam shells of different species. Shells of *Elliptio crassidens* from a midden show Sr, Ba, and Mn concentrations 50 to 100 percent higher than normal. Loss of forests due to agriculture reduced the CO_2 in the soil and consequently reduced rates of dissolution of alkaline earth carbonates from the soil matrix.—*from* Author's abstract

Neuerburg, George J. *See* Curtin, Gary C. 01143

Nicholls, J. *See* Lindsley, D. H. 00970

00856 **Nikravesh, Rashel.** The foraminifera and paleoecology of the Blufftown Formation (Upper Cretaceous), of Georgia and eastern Alabama [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 7, p. 2902B, 1968.

Noble, D. C. *See* Rogers, C. L. 00825

00964 **Northrop, John.** Comments on a paper by J. B. Shepherd and G. R. Robson, "The source of the T phase recorded in the eastern Caribbean on October 24, 1965" [1967]: Seismol. Soc. America Bull., v. 58, no. 2, p. 743–744, 1968.

If the low-frequency transient signal from the Kick-em Jenny Seamount, described by Shepherd and Robson (ibid., v. 57, no. 2, p. 227–234, 1967), was indeed due to collapsing steam bubbles during a submarine eruption, the appellation "T phase" is unwarranted because it was not generated by an earthquake. A good working rule can be stated simply as "no earthquake, no T phase."—DBV

06816 **Nugent, Robert Charles.** Jointing in a Quaternary basalt, Buckboard Mesa, Nevada, and its effect on cratering experiments [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 6, p. 2484B, 1967.

00890 **Nunan, Walter Edward; Lipps, Emma Lewis.** A Devonian fauna from the Frog Mountain Sandstone, Floyd County, Georgia [abs.]: Georgia Acad. Sci. Bull., v. 26, no. 2, p. 71, 1968.

01114 **Odé, Helmer.** Review of mechanical properties of salt relating to salt dome genesis, *in* Saline deposits—Internat. Conf. Saline Deposits, Houston, Tex., 1962, Symposium: Geol. Soc. America Spec. Paper 88, p. 543–595, illus., tables, 1968.

The ability of salt to flow or be deformed under differential pressure is very important in explaining the formation and shape of salt structures. The time dependent strain, or "creep" of salt and other nonmetallic bodies is not well understood, but available data show that, under suitable conditions, salt and other nonmetallics will show behavior similar to that of metals. From laboratory and field data on salt creep it is possible to derive for the given conditions of stress, temperature, and environment an equivalent viscosity for the salt. In this manner, a rough idea can be obtained concerning the equivalent viscosity of salt. Unfortunately, the values obtained show wide variations, which amounts to many orders of magnitude.—*from* Author's abstract

Odé, Helmer. *See* Mattox, Richard B. 01119

06817 **O'Donnell, Edward.** The lithostratigraphy of the Brassfield Formation (Lower Silurian) in the Cincinnati Arch area [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 6, p. 2484B–2485B, 1967.

06911 **Ogden, J. Gordon, 3d.** Radiocarbon determinations of sedimentation rates from hard to soft-water lakes in northeastern North America, *in* Quaternary paleoecology—Internat. Assoc. Quaternary Research, 7th Cong., 1965, Proc., V. 7: New Haven, Conn., Yale Univ. Press, p. 175–183, illus., tables, 1967.

Lakes in Ohio and Massachusetts show different sedimentation rates since the close of the Valderan substage. In Ohio, the rate is 4.3 cm per century for early postglacial, 6.1 cm for the hypsithermal, and 25 cm for the top 2 m of sediments. In Massachusetts, the rate is about 4.5 cm per century for the early postglacial, 5.0 cm for the hypsithermal, and 6.8 cm for the upper 1.5 m of core. For both lakes, calculations for the corrections are shown. Also, in both lakes, the sedimentation rates for post-colonial time are considerably greater than in the rest of the cores.—*from* Author's abstract

06913 **Ogden, J. Gordon, 3d.** Radiocarbon and pollen evidence for a sudden change in climate in the Great Lakes region approximately 10,000 years ago, *in* Quaternary paleoecology—Internat. Assoc. Quaternary Research, 7th Cong., 1965, Proc., V. 7: New Haven, Conn., Yale Univ. Press, p. 117–127, illus., table, 1967.

Changes in the pollen spectra in lakes and bogs of the Great Lakes region reflect the climatic change that initiated retreat of the Valders ice. Radiocarbon dates from pollen in southern Minnesota show the replacement of boreal by deciduous forest about 10,230 years ago; in northeastern Minnesota, birch was replaced by spruce and pine about 10,180 years ago. Similar changes can be detected in Indiana, although radiocarbon dates are not available. In western Ohio, the replacement of conifers by deciduous trees is dated at 10,600; in western Pennsylvania, this transition occurs at about 9,310 years. The change from 50 percent spruce to 50 percent oak occurs over a sediment thickness of no more than 60 cm. Rates of 4.3 cm per year are used, so that the climatic change occurred in about 1200 years.—*from* Author's abstract

06877 **Ohle, Ernest L.** The origin of ore deposits of the Mississippi Valley type, *in* Genesis of stratiform lead-zinc-barite-fluorite deposits (Mississippi Valley type deposits)—A symposium, New York, 1966: Econ. Geology Mon. 3, p. 33-39, illus., 1967.

Certain gross aspects of the different lead-zinc-barite fluorspar deposits of this type in North America provide compelling guidelines that must be followed in determining the most likely mode of origin for the deposits. These field-determined facts must be the starting point for the interesting and illuminating laboratory investigations which are revealing what is or is not possible from a physical-chemical point of view. Pertinent field facts that are discussed are: the multiplicity of elements involved, the large size of the ore districts, the cross-cutting relationships, the selective replacement phenomena, and the diversity of ore host rocks.—Author's abstract

00857 **Ojakangas, Dennis Roger.** Mathematical simulation of oil trap development [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 7, p. 2903B, 1968.

Okamura, R. *See* Shaw, H. R. 01039

Oliver, Jack. *See* Page, Robert A. 00963

00809 **Olson, Everett C.** The family Caseidae: Fieldiana—Geology, v. 17, no. 3, p. 225-349, illus., tables, 1968.

The family is a closely related group of pelycosaurians from the Upper Permian of Texas and Oklahoma, and from the U.S.S.R.; all are strikingly conformable to a common pattern except for size. The length of adults varies from 4 to 20 feet, the head was relatively small, and the body was long, massive, and barrel shaped. The family was primarily terrestrial and herbivorous. A taxonomic review follows an extensive review of the morphology.—HRC

01058 **Olson, Gerald W.; Marshall, Raymond L.** Using high-intensity soil surveys for big development projects—A Cornell experience: Soil Sci., v. 105, no. 4, p. 223-231, illus., tables, 1968.

High-intensity soil surveys are for soil formation to assist in planning and constructing a wide assortment of facilities, ranging from homes and industrial plants to cemeteries. The cost for making high-intensity soil surveys is greater than standard soil surveys, because aerial photographs at large scales are used for mapping with greater detail for delineations.—JWH

06917 **Olsson, Axel A.** Pustularias (*Jenneria*) in the American Neogene: Acad. Nat. Sci. Philadelphia Notulae Naturae, no. 403, 13 p., illus., 1967.

Various species of *Jenneria* from the Miocene Gurabo beds in the Dominican Republic, from the Pliocene Caloosahatchee Marl of Florida, and from the Limon beds of Late Miocene age in Costa Rica are described and illustrated.—HRC

Olsson, Richard K. *See* Berggren, William A. 00940

Oltman, B. G. *See* Feige, Y. 00967

O'Neill, B. J., Jr. *See* Hoy, Robert B. 01017

00858 **Orlansky, Ralph.** Palynology of the Upper Cretaceous Straight Cliffs Sandstone, Garfield County, Utah [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 7, p. 2903B, 1968.

00895 **Ostrander, Charles C.** An approach to geological data storage and retrieval systems [abs.]: Georgia Acad. Sci. Bull., v. 26, no. 2, p. 69, 1968.

00800 **Page, Norman J.** Serpentinization in a sheared serpentinite lens, Tiburon Peninsula, California, *in* Geological Survey research 1968, Chap. B: U.S. Geol. Survey Prof. Paper 600-B, p. B21-B28, illus., 1968.

A well-exposed sheared serpentinite lens on Tiburon Peninsula, Marin County, Calif., in the Franciscan Formation was mapped and sampled. Remnant olivine and enstatite indicate the parent material was a peridotite, now 95 to 100 percent serpentine with local magnetite and carbonate minerals. Composition of mesh texture (chrysotile+lizardite), vein (chrysotile), and bastite (lizardite) serpentines increases in FeO content during serpentinization as shown by electron microprobe, X-ray, and textural studies. Brucite was not identified, although it has been reported in other Coast Range ultramafic bodies. Its absence may be caused by reaction with SiO_2 carried by large volumes of water through the sheared serpentinite to form the abundant late chrysotile veins that crosscut all other structural and mineralogical features in the lens.—*from* Author's abstract

Page, Robert. *See* Isacks, Bryan. 01126

00963 **Page, Robert A.; Molnar, Peter H.; Oliver, Jack.** Seismicity in the vicinity of the Ramapo fault, New Jersey-New York: Seismol. Soc. America Bull., v. 58, no. 2, p. 681-687, illus., tables, 1968.

Since 1962 the Lamont seismograph network in southeastern New York and northern New Jersey has recorded four small earthquakes with epicenters along the Ramapo fault near the New York-New Jersey border. The northeast trending fault separates the Triassic basin to the southeast from the Precambrian highland to the northwest. The proximity of these events to the fault and the previous earthquake history of the area suggest that much of the seismic activity of the areas is associated with this major tectonic feature, which has apparently not been highly active since the Triassic.—Authors' abstract

Paine, William R. *See* Dickey, Parke A. 01089

Parker, F. L. *See* Bradshaw, R. L. 01118

01083 **Patterson, Norman R.** Developments in ground EM prospecting: Canadian Mining Jour., v. 89, no. 4, p. 106-110, illus., 1968.

The Huntematic horizontal loop EM equipment is described and examples of results obtained are given.—ARK

00805 **Patton, Thomas H.** Fossil vertebrates from Navassa Island, W.I.: Florida Acad. Sci. Quart. Jour., v. 30, no. 1, p. 59-60, 1967 [1968].

Navassa Island is a flat-topped limestone block west of Haiti. Innumerable limestone solution pits and cavities in the flat upper surface contain cemented phosphatic rock which is sparsely fossiliferous. A preliminary list of fossil vertebrates of probable Pleistocene age consists of five genera of reptiles, not yet identified as to species. Of these, two turtles and a snake are previously unreported from Navassa.—VMJ

Pauken, R. J. *See* Wolleben, J. A. 01045

Paul, Christopher R. C. *See* Kesling, Robert V. 00807

00987 **Peacock, William H.; Seed, H. Bolton.** Sand liquefaction under cyclic loading simple shear conditions: Am. Soc. Civil Engineers Proc., v. 94, paper 5957, Jour. Soil Mechanics and Found. Div., no. SM3, p. 689–708, illus., 1968.

Extensive damage resulting from soil liquefaction in recent earthquakes has emphasized the need for reliable procedures for predicting this development. Cyclic simple shear tests were used on uniform sand from Monterey, Calif., simulating stresses induced in the field in soils during an earthquake. Stresses were about 35 percent of those determined by triaxial tests, but it is suggested that the shear test induced liquefaction at stress levels 40 to 50 percent lower than those corresponding to actual field conditions, and that a correction factor of this order of magnitude should be applied to laboratory simple shear test data intended for use in the analyses of field problems. The test program also showed that frequency effects, within the range from 1/6 to 4 cps, are small.—ESL

01109 **Pease, Maurice H., Jr.** Cretaceous and lower Tertiary stratigraphy of the Naranjito and Aguas Buenas quadrangles, and adjacent areas, Puerto Rico: U.S. Geol. Survey Bull. 1253, 57 p., illus., tables, geol. map, 1968.

Cretaceous and lower Tertiary stratigraphic units exposed in the Naranjito and Aguas Buenas quadrangles, Puerto Rico, consist mostly of complexly interfingered submarine lava and related fragmental deposits. Shallow-water marine sedimentary rocks and nonmarine deposits are present. Early Cenomanian, pre-Maestrichtian, and pre-Oligocene unconformities are recognized. The stratigraphic sequence has been dismembered by wrench faults. Dikes and stocks of quartz diorite and related intrusive rocks are widely distributed, and the intruded country rock is commonly altered to greenstone. Quartz diorite and associated country rock exposed along several major wrench faults have been altered by hydrothermal solutions. Large-scale igneous intrusion and hydrothermal activity probably took place during the Campanian, but minor activity continued into the Paleocene.—MHP

Peck, D. L. *See* Shaw, H. R. 01039

Peck, Dallas L. *See* Wright, Thomas L. 00980

00802 **Pemberton, H. Earl; Alexander, G. S.** A new zeolite locality in California—Overlooked 115 years ago: Mineral Explorer, v. 2, no. 4, 8 p., illus., 1968.

W. P. Blake reported amygdaloidal rocks at a camp site, in what is today called Hunt Canyon, *in* "Geological reconnaissance in California" (1858). A recent visit by the authors revealed that the amygdules of the volcanic rocks contain agates, heulandite, mordenite, cristobalite, opal, calcite and acicular goethite. The rocks are apparently an outcrop of the Vasquez Formation, exposed principally in the Soledad basin west of Hunt Canyon. Interbedded basalt and andesite are amygdaloidal and contain chalcedony, opal and some zeolites. In contrast, the chalcedony nodules in Hunt Canyon are very small and the zeolite occurrences the only ones of their type thus far reported from the Vasquez Formation.—GDC

06840 **Pemberton, H. Earl.** Antimony Peak—A rerun of a field trip 110 years later: Mineral Explorer, v. 2, no. 2, 6 p., illus., 1967.

Intrigued by William Blake's story of Antimony Peak *in* "Geological reconnaissance in California" (1858) and by later reports of antimony minerals found there, the author's party visited the area by a different route from the south to the Pleito Canyon float area below the mineralized zone in the scarred quartz-diorite face of Antimony Peak. Little antimony has been produced there but float up to one foot in diameter may still be found, most of it massive stibnite with some associated native antimony, stibiconite, valentinite, and quartz crystals. Small but perfectly formed crystals are found in vugs and along the quartz border of some of the specimens. The country is very rough and potentially dangerous for collecting.—GDC

06789 **Peroz, F.** Le role des filons basiques dans l'élucidation des étages tectoniques, *in* Étages tectoniques—Colloque de Neuchâtel, Neuchâtel Univ. Inst. Géol., 1966: Neuchâtel, Switzerland, La Baconnière, p. 151–159, illus., 1967.

Basic dikes in the Precambrian shield of southwest Greenland differ in degree of competence with respect to the enclosing rocks. One group of dikes is folded and sheared. Structures in a second group are partially or totally destroyed, and recrystallization has occurred. The two types of deformation occurred contemporaneously, but at different tectonic levels.—JPF

00971 **Peselnick, Louis; Wilson, William H.** Wave velocities and hysteresis in Solenhofen limestone for pressures up to 12 kilobars: Jour. Geophys. Research, v. 73, no. 10, p. 3271–3280, illus., tables, 1968.

Precision shear (S) and longitudinal (P) ultrasonic velocity measurements were made on jacketed and unjacketed Solenhofen limestone as a function of hydrostatic pressure to 12 kb. Measurements of P velocities were made in the C direction of calcite to 12 kb and in fused quartz to 14 kb. For constant pressure below 5 kb, P and S velocities in jacketed limestone are directly proportional to initial specimen density. After subjecting specimens to pressures greater than 5 km, they exhibit a permanent decrease in zero-pressure velocity and a 'negative velocity hysteresis'. Unjacketed samples exhibited a 'positive velocity hysteresis'. Velocities for jacketed limestone fall sharply at pressures exceeding 8 kb. Comparison with unjacketed specimens provides experimental evidence that the often observed sharp decrease in velocity below 15 kb is a result of local stress concentrations in the specimen.—*from* Authors' abstract

00908 **Pessagno, Emile A., Jr.; Miyano, Kei.** Notes on the wall structure of the Globigerinacea: Micropaleontology, v. 14, no. 1, p. 38–50, illus., 1968.

Electron microscope, phase contrast, and dark field illumination analyses of Globigerinacea indicate that septal walls in both axial and horizontal sections are microgranular hyaline in character. The primary outer wall of Cretaceous Globigerinacea is microgranular hyaline, whereas Cenozoic Globigerinacea may have outer walls which are entirely microgranular hyaline, both radial hyaline and microgranular hyaline, or rarely, entirely radial hyaline. Mesopelagic forms of *Globorotalia truncatulinoides*, for example, possess an outer wall divided into (1) a radial hyaline "calcite crust" composed of euhedral calcite prisms oriented with their C-axes normal to the surface of the test and (2) an inner laminated layer composed of heterogeneous microgranules of hyaline calcite.—*from* Authors' abstract

01158 **Peterson, D. J.; Fitzgerald, E. L.** Inga—British Columbia's 1966 exploratory highlight grows: Oil and Gas Jour., v. 66, no. 19, p. 180–182, 185–189, illus., 1968.

The discovery of oil in a thin sandstone in the Triassic Charlie Lake Formation at Inga has proven to be one of the most interesting of recent discoveries in western Canada. To date, 77 wells have been drilled in and around the Inga field; four produce natural gas, 53 oil, and 20 are dry holes. Few wells have penetrated below the 7,000 ft thick section of Mesozoic rocks. The main pay, the Inga Member of the Charlie Lake Formation, is a well-rounded quartz sandstone cemented with dolomite and infilled with a variable amount of secondary anhydrite. The trap is a structural-stratigraphic type associated with two Laramide anticlines. Oil production is limited laterally by the disappearance of porosity and vertically by a gas column. Proven areal extent of the reservoir is about 20,000 acres. Initial daily potential of Inga wells is from 40-bbl to 380-bbl.—HHA

01018 **Peterson, James A.** Regional stratigraphy of the Paradox basin, Utah and Colorado [abs.], *in* Saline deposits—Internat. Conf. Saline Deposits, Houston, Tex., 1962, Symposium: Geol. Soc. America Spec. Paper 88, p. 412–413, 1968.

06918 **Petryk, A. A.** Some Silurian stromatoporoids from northwestern Baffin Island, District of Franklin: Canada Geol. Survey Paper 67-7, 51 p., illus., tables, 1967.

Two separate and distinct stromatoporoid faunas occur in the carbonate facies of the Baillarge and Cape Crauford Formations, which comprise the Brodeur Group (late Middle Ordovician to Niagaran). The faunas indicate a Lower to Middle Silurian (Upper Llandovery to Wenlock) age. Among the fourteen species described are new species of *Clathrodictyon* (*C. lenticulare*, *C. miniapse*), *Intexodictyon* (*I.*

brodeurense), *?Gerronostroma (G. juvene)*, *Stromatopora (S. baffinensis, S. baillargensis)*, and *Actinodictyon (A. crispatum)*.—Author's abstract

01051 **Pettyjohn, Wayne A.** Geology and ground water resources of Renville and Ward Counties—Pt. 2, Ground water basic data: North Dakota Geol. Survey Bull. 50, pt. 2 (North Dakota Water Comm. County Ground Water Study 11), 302 p., illus., tables, 1968.

Records of 1,373 wells and test holes are tabulated under the counties and include depth of well, depth to water, aquifer, and lithology. Water levels in 81 selected wells, over periods of one to five years, and logs of 242 test holes and selected wells are given. Chemical analyses of 416 water samples are tabulated, and the source and significance of constituents are discussed briefly. A map showing the location of wells and test holes in the counties accompanies the report.—ESL

Pickering, S. M., Jr. *See* Green, Martha A. 00803

00880 **Pickering, Sam M., Jr.** Biostratigraphically significant echinoids from Eocene and Oligocene sediments of the Middle Georgia Coastal Plain [abs.]: Georgia Acad. Sci. Bull., v. 26, no. 2, p. 73, 1968.

00889 **Pickering, Sam M, Jr; Allen, Thomas E.** Description of a new Georgia tektite from Washington County [abs.]: Georgia Acad. Sci. Bull., v. 26, no. 2, p. 71, 1968.

Pierce, A. P. *See* Cannon, R. S. 06874

Pilkey, Orrin H. *See* Cleary, William J. 01150

01108 **Pipiringos, G. N.; Bergman, S. C.; Trent, V. A.** Geologic map of the Ezel quadrangle, Morgan and Menifee Counties, Kentucky: U.S. Geol. Survey Geol. Quad. Map GQ-721, scale 1:24,000, section, text, 1968.

Coal in the Ezel quadrangle is mined locally from the Breathitt and Lee Formations; the Warm Fork bed in the latter is as much as 27 inches thick and may have commercial potential. Breathitt shale has possibilities for various uses, and the Olive Hill Clay bed, a refractory clay, is one of the most important potential economic mineral resources. Sandstone of the Breathitt has been used locally for various purposes. Limestone beds in the upper member of the Newman Limestone have been quarried; other favorable areas could be developed if access roads were built. Oil and gas have been produced sporadically from a few isolated wells in Silurian, Devonian, and Late Ordovician strata.—MCM

06895 **Pohlmann, Henry Fred.** Dineh bi Keyah lifts Navajo spirits: Oil and Gas Jour., v. 65, no. 41, p. 205-211, illus., 1967.

The Dineh bi Keyah field on the Navajo Indian Reservation in Arizona began production early in 1967 and continues to expand. Present production is 15,000 bbl oil per day from a porous syenite sill in Pennsylvanian strata. The reserves must be very large. In addition, helium has been discovered in the Devonian interval beneath the syenite reservoir. The field will spur drilling activity in nearby parts of Arizona and New Mexico and will be of great benefit to the Navajo people.—PTH

00859 **Pollard, Charles Oscar, Jr.** Attempted correlation of bond nature with anisotropic anion polarizability in rutile-type minerals [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 7, p. 2903B-2904B, 1968.

00860 **Pollard, Lin Davis.** Sedimentation rate determinations on ocean bottom cores by gamma ray spectrometry [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 7, p. 2904B, 1968.

00826 **Powers, Maurice C.** Meccanismo della fuoruscita di acqua dalle argille compattate e loro importanza nell'esplorazione petrolifera: Scuola Azione 1968, no. 4, p. 180-212, illus., translated 1968; originally published in English in 1967.

This is an Italian translation of "Fluid-release mechanisms in compacting marine mudrocks and their importance in oil exploration" (Am. Assoc. Petroleum Geologists Bull., v. 51, no. 7, p. 1240–1254, 1967).—MCM

00924 **Price, Van; Ragland, P. C.** Ground water chemistry as a tool for geologic investigations in the southeastern Piedmont: Southeastern Geology, v. 9, no. 1, p. 21–38, illus., tables, 1968.

Ground water samples from the Kings Mountain–Charlotte area, N. C. were analyzed by atomic absorption spectrophotometry for Li, Na, K, Rb, Mg, Ca, Sr, Cu, and Zn. Rock types exhibiting large chemical differences can be distinguished on the basis of water chemistry. The Kings Mountain lithium belt is delineated by water containing detectable lithium. The ratio of Zn concentration to that of the major cations in ground water can be used to distinguish between barite and sulfide producing belts in the area. Magnesium and strontium exhibit a positive correlation, both increasing in the more mafic terranes. Anomalous chemistry can be related to contamination in several samples. Subtle chemical differences between lithologies, for example mica schists compared with granitic igneous rocks, cannot be recognized on the basis of ground water chemistry.—*from* Authors' abstract

01064 **Prihar, S. S.; Sandhu, B. S.** A rapid method of soil moisture determination: Soil Sci., v. 105, no. 3, p. 142–144, illus., table, 1968.

A two-piece, 100 ml glass flask has been devised for rapid determination of soil moisture. The principle involved is the variable increase in the known volume of liquid with the addition of a soil sample of varying moisture contents. The increase in volume is measured in a calibrated tubular stopper of the flask.—JWH

00734 **Prill, Robert C.; Meyer, Walter R.** Neutron moisture measurements by continuous- and point-logging procedures, *in* Geological Survey research 1968, Chap. B: U.S. Geol. Survey Prof. Paper 600-B, p. B226–B230, illus., 1968.

A recently developed neutron meter records moisture measurements by continuous and point-logging procedures. Field calibration of the meter shows a linear relationship between the instrument reading and the moisture content over a range of 5 to 40 percent moisture by volume. Comparison of neutron moisture logs obtained by different logging procedures illustrates that a compromise must be made between logging time, bed definition, and curve reproducibility. Tests indicate that the point-logging procedure, using close logging intervals, provides the more accurate logs. However, the continuous-logging procedure, which requires much less time and manual operation, can provide acceptable logs for many moisture studies.—Authors' abstract

Protz, R. *See* Walker, P. H. 00898

Protz, R. *See* Walker, P. H. 00902

00816 **Putnam, George W.; Alfors, John T.** Granitic rocks and ore deposits—The Rocky Hill study: California Div. Mines and Geology Mineral Inf. Service, v. 21, no. 4, p. 55–60, illus., 1968.

General discussion stresses relationships of base metals to plutonic granitic rocks, but could also be applied to extrusive volcanics. Subtle clues to unusual concentrations may lie in answers to questions concerning metal content of ore-bearing bodies compared with other intrusives and its change with depth, mineralization in cooling stages of periods of magma intrusion, and relation of intrusive metallogenic bodies to time and space. In a specific geochemical investigation at Rocky Hill, a uniform stock in Tulare County, Calif., fresh granodiorite was sampled on a grid pattern. From spectrographic analyses, areal distribution patterns of the various metals were plotted, and from these regional trends of nickel, sulfur, and copper were computer-derived. Techniques used can serve as a basis for studies in other metallogenic districts.—GDC

00972 **Pye, E. G.** Geology of the Crescent Lake area: Ontario Dept. Mines Geol. Rept. 55, 72 p., illus., tables, geol. map, 1968.

The oldest rocks in the Crescent Lake area of Thunder Bay District are interbanded, conformable Archean metavolcanics and metasediments, assigned to a single unit known as the Marshall Lake Group which has been intruded by small bodies of basic or ultrabasic rocks. Younger, large, silicic batholithic masses flank this complex on the north and south. The youngest igneous rocks are Keweenawan diabases which occur as steeply dipping dikes and flat sheets. The Archean complex has been isoclinally folded; superposed on this are secondary folds related to the large igneous intrusions. The granitic stock at Summit Lake has given rise to a west-plunging dome. Other complexities occur as a result of postgranite, but prediabase faults. Mineral deposits containing one or more of asbestos, beryl, Cu, Au, Fe, Pb, Li, Mo, Ni, and Zn have been discovered in the area.—KAS

01043 **Pye, E. G.** Geology of Lac des Iles area, District of Thunder Bay: Ontario Dept. Mines Geol. Rept. 64, 47 p., illus., tables, geol. maps, 1968.

The general, structural, and economic geology are outlined of a Precambrian area including that of Max Lake, between Lac des Iles and Poshkokagan Lake. Archean metavolcanics and metasediments, on the projected strike of the Little Long Lac-Sturgeon River gold belt with which they can be correlated, form a wide belt along the north limb of a northeast-pitching syncline. Of two basic igneous stocks affected by Archean regional metamorphism, one at Lac des Iles on the north flank is enclosed by younger granitic rocks emplaced during the Kenoran orogeny. Erosional remnants of Keweenawan diabase sheets form high precipitous hills. Eight irregular-shaped bodies of disseminated sulfides, in gabbroic rocks of the Lac des Iles stock, contain promising copper, nickel, palladium, platinum, and a little gold. Two of the numerous quartz veins contain some molybdenite.—GDC

06773 **Quinlan, James F.; Smith, A. Richard.** Drip-pockets and related karst cavities in gypsum [abs.]: Caves and Karst, v. 9, no. 6, p. 50, 1967.

Radcliffe, Dennis. *See.* Bailey, Arthur C., Jr. 00896

00861 **Radtke, Arthur Sears.** Minor elements in iron ores from the western United States [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 7, p. 2904B-2905B, 1968.

Ragland, P. C. *See* Price, Van. 00924

00827 **Randich, P. G.** Ground-water levels in North Dakota, 1966: North Dakota Water Comm., North Dakota Ground-Water Study 74, 117 p., illus., tables, 1968.

This is the first of a series of annual reports containing records of selected observation wells. Objectives of the observation-well program are: to provide long-term continuous records of fluctuations in wells in major aquifers, to indicate storage in aquifers, to aid in prediction of base flow of streams, and to provide information for use in water resources research. Lists of available reports resulting from the county ground-water studies program and reports for local areas are included; causes of water-level fluctuations are reviewed. Records are given by counties in tables and graphs.—ESL

01055 **Rao, S. V. L. N.** FORTRAN II program for the calculation of Wilks' Λ using an IBM 1620 computer, *in* Computer programs for multivariate analysis in geology: Kansas Geol. Survey Computer Contr. 20, p. 52-58, tables, 1968.

Analysis of variance is one of the most widely used statistical techniques in geology. Previous methods were based on a univariate model, but most problems are multivariate. Wilks' Λ criterion, analysis of dispersion, is a widely applicable multivariate technique. In the present program, up to 12 data groups may be used, each containing up to 10 variables and any number of observations.—ESL

06883 **Rao, S. V. L. N.; Srivastava, G. S.** Comparison of subset trend surfaces by utilization of information theory, *in* Computer applications in the earth sciences—Colloquium on time-series analysis: Kansas Geol. Survey Computer Contr. 18, p. 62-67, illus., tables, 1967.

A detailed discussion on different methods employed for the comparison of polynomial trend surfaces is outlined. The trend and residual components are treated by modern analytical methods that are used currently in communication theory, as the signal and noise content of spatial-spectral series.—Authors' abstract

00891 **Ray, Clayton E.; Lipps, Lewis.** Additional notes on the Pleistocene mammals from Ladds, Georgia [abs.]: Georgia Acad. Sci. Bull., v. 26, no. 2, p. 63, 1968.

00931 **Reed, Bruce L.; Elliott, Raymond L.** Lead, zinc, and silver deposits at Bowser Creek, McGrath A-2 quadrangle, Alaska: U.S. Geol. Survey Circ. 559, 17 p., illus., tables, 1968.

New occurrences of lead, zinc, and silver of potential economic significance were identified during a heavy metals investigation of the southern Alaska Range in 1967; deposits, about 23 miles south of Farewell, are replacement bodies and fissure veins in limestone and fracture fillings in igneous breccia. Deposits in limestone show a close spatial relation to igneous breccia and granodiorite porphyry as well as to felsite dikes; ore minerals are argentiferous galena and sphalerite. Deposits in breccia consist of pyrrhotite and sphalerite and may represent only part of a more extensively mineralized breccia mass. Although most of the deposits that crop out are sporadic and discontinuous, their possible continuity beneath surficial deposits, and a favorable geologic environment suggest that the area has an economic potential for base and precious metals.—*from* Authors' abstract

Reed, G. W. *See* Jovanovic, S. 00904

01130 **Reger, Richard D.** Recent history of Gulkana and College Glaciers, central Alaska Range, Alaska: Jour. Geology, v. 76, no. 1, p. 2-16, illus., 1968.

Four sets of young moraines that lie above the tree line are dated by amount of lichen growth as having been deposited by advances in 1580(?), 1650(?), 1830 and 1875. Older moraines could not be dated by lichenometry. Successive readvances after 1580(?) caused burial of older moraines and manifold changes such as channel diversions and damming of tributary valleys, including that of College Creek by Gulkana Glacier. The most extensive advance dated by lichenometry was that of 1830. Since 1875, both glaciers have markedly thinned and retreated.—DRM

Reyment, Richard A. *See* Berggren, William A. 00940

00939 **Reynolds, Robert C., Jr.** The effect of particle size on apparent lattice spacings: Acta Cryst., v. A24, pt. 2, p. 319-320, illus., 1968.

Theoretical considerations suggest that particle-size effects can produce anomalous values for d_{001} in certain structures. The effect is explained here in terms of the Laué interference function. Experimental results on very fine-grained mica correlate well with the theoretical relation between particle thickness and d_{001}.—Author's abstract

00862 **Richmond, William Oliver.** Paleozoic stratigraphy, and sedimentation of the Slave Point Formation, southern Northwest Territories and northern Alberta [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 7, p. 2905B, 1968.

06943 **Rimbach, Don.** Stone County caves: Missouri Speleology, v. 9, no. 2, p. 19-27, illus., 1967.

Of the 51 known caves in Stone County, four are commercial. Ordovician and Mississippian strata, mostly carbonates, are exposed, and some caves range through a considerable stratigraphic interval. Belle Star Cave has a 30-ft long room recognized as a recession canyon, with three 25-ft waterfalls during rainy spells. Hayes Cave, with one of the largest entrances in the State has an interesting history of calcite-encrusted bones and cave "potatoes".—ESL

06768 **Rinehart, John S.** Activity of Old Faithful Geyser [abs.]: Colorado-Wyoming Acad. Sci. Jour., v. 5, no. 8, p. 54, 1967.

Robeck, R. C. *See* Hawley, C. C. 00941

Robinson, Charles S. *See* Carroll, Roderick D. 00792

Rodda, J. L. *See* Kohls, D. W. 06950

Roddick, J. A. *See* Hutchison, W. W. 01032

06866 **Roedder, Edwin.** Environment of deposition of stratiform (Mississippi Valley-type) ore deposits, from studies of fluid inclusions, *in* Genesis of stratiform lead-zinc-barite-fluorite deposits (Mississippi Valley type deposits)—A symposium, New York, 1966: Econ. Geology Mon. 3, p. 349-361, illus., table, 1967.

From evidence of fluid inclusions in ore and gangue minerals of stratiform deposits, it is apparent that ore fluids were slow-moving, hot, dense, Na-Ca-Cl brines, containing abundant organic matter. The most striking feature is uniformity of temperature, density, chemical composition, and salinity over a wide range of stratiform-type deposits. These data do not determine the origin or origins but place severe limitations on possible mechanisms of ore transport and deposition. Origin by sedimentary-syngenetic, volcanic exhalative, simple magmatic-hydrothermal, and meteoric circulation processes seem to be precluded by inclusion data; deposition from modified, deep-circulating, heated connate brines is compatible and is considered a satisfactory working hypothesis.—*from* Author's abstract

06783 **Roellig, Harold Frederick.** The Osteoglossidae, fossil and Recent [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 6, p. 2485B, 1967.

00825 **Rogers, C. L.; Ekren, E. B.; Noble, D. C.; Weir, J. E.** Geologic map of the northern half of the Black Mountain quadrangle, Nye County, Nevada: U.S. Geol. Survey Misc. Geol. Inv. Map I-545, scale 1:62,500, 1968.

06769 **Ronzio, A. R.; Salmon, M. L.** Relation between source and composition of turquoise [abs.]: Colorado-Wyoming Acad. Sci. Jour., v. 5, no. 8, p. 30-31, table, 1967.

00818 **Ross, B. A.; Testér, J. R.; Breckenridge, W. J.** Ecology of Mima-type mounds in northwestern Minnesota: Ecology, v. 49, no. 1, p. 172-177, illus., table, 1968.

This report on physiognomy, soils, microclimate, vegetation, and animal activity on Mima mounds in Minnesota presents an hypothesis on the origin of these mounds, which vary in size from 10 to 130 feet in maximum dimension, from 6 to 50 inches in height, and occur about one per acre on 210.5 acres of upland native prairie. Disturbance of their soil by small animals has probably caused the change in vegetation, lower bulk density, lack of soil structure, and increased soil permeability, and may also account for lack of sod, high organic content of the subsurface silt loam, zone of gradation of silt into clay, discontinuity of the zone of carbonate concentration, and most of the anomalies such as pockets of pebbles. Comparison of the mound and adjacent prairie soils suggests the mounds are "puffs" of soil formed primarily by animals disturbing and mixing the soil in a particular spot.—*from* Authors' abstract

06870 **Russell, R. D.; Slawson, W. F.** Constraints imposed by lead isotope abundances on the origin of ores, *in* Genesis of stratiform lead-zinc-barite-fluorite deposits (Mississippi Valley type deposits)—A symposium, New York, 1966: Econ. Geology Mon. 3, p. 383-391, illus., 1967.

A new approach in interpretation of lead isotope evolutionary patterns is based on the observation that each of the integral decay equations can be considered to be a weighted average. The predepositional history of a lead sample can be described in terms of the U/Pb and Th/Pb ratios of the environment; one lead ratio gives little information, but the requirement that two different weighted means be mutually consistent restricts the choice and provides a constraint that must be satisfied by theories for the predepositional history of ore samples. Mississippi Valley-type leads are cited as examples of leads thought to occur over a single Precambrian province

1,350 m.y. old. They require a multistage history to satisfy the above conditions; histories are described which involve evolution of lead in subcrustal as well as in crustal environments.—*from* Authors' abstract

00984 **Rutter, N. W.; Taylor, G. C.** Bedrock geology along Ingenika and Finlay Rivers, Peace River Reservoir area, British Columbia: Canada Geol. Survey Paper 68-10, 9 p., illus., 1968.

A portion of the Rocky Mountain Trench about to be flooded behind the Bennett Dam was examined. Twelve exposures of bedrock were located, samples obtained, and thin sections of these were studied. Each sample was assigned, according to its lithology and metamorphic facies, to either the Sifton Formation [Cretaceous-Paleocene], Tenakihi [Precambrian], Ingenika [Cambrian], or Misinchinka [Precambrian] Groups. The samples have been placed in the permanent collection of the Geological Survey of Canada.—Authors' abstract

Saamoto, K. *See* Tanaka, S. 01062

01019 **Salas, G. P.** Saline deposits of northern Mexico [abs.], *in* Saline deposits Internat. Conf. Saline Deposits, Houston, Tex., 1962, Symposium: Geol. Soc. America Spec. Paper 88, p. 414, 1968.

Salmon, M. L. *See* Ronzio, A. R. 06769

06934 **Salotti, Charles A.; Fouts, James A.** Specific cations in ground waters related to geologic formations in the Broad quadrangle, Georgia: Georgia Geol. Survey Bull. 78, 34 p., illus., tables, geol. map, 1967.

For this study of trace-element behavior in ground water percolating through metamorphic terrain, a special field laboratory was built, this Piedmont area was mapped geologically, and 12 wells were analyzed between Dec. 1965 and July 1966 for Ca, Mg, Zn, Cu, Fe, and Mn, by atomic-absorption and spectrophotometry, recording also water temperatures and regional rainfall. Results show: (1) quantitative dependence of ground-water trace elements to enclosing rock types; (2) adjustment of migrating ground water to contrasting lithologies; (3) quantitative variations in composition with seasonal temperatures and rainfall; and (4) possible relation between specific trace-element contents and organic activity.—*from* Authors' abstract

01006 **Sampson, Robert J.** R-mode factor analysis program in FORTRAN II for the IBM 1620 computer, *in* Computer programs for multivariate analysis in geology: Kansas Geol. Survey Computer Contr. 20, p. 13-38, tables, 1968.

Factor analysis has been applied to problems of paleontologic taxonomy, petrology, and mineral exploration. The R-mode program searches for structure within the variables, and the factors express sources of variation affecting observations. Any number of data points may be processed because data is not stored internally. The test example is 122 analyses of brines from the Arbuckle Group in Kansas. The program has also been translated in FORTRAN IV.—ESL

Sampson, Robert J. *See* Davis, John C. 06933

00863 **Sanders, Robert Bruce.** Palynological investigation of Desmoinesian and Missourian strata, Elk City area, Oklahoma [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 7, p. 2906B, 1968.

Sanderson, R. B. *See* Johnson, P. W. 00915

Sandhu, B. S. *See* Prihar, S. S. 01064

00953 **Sanford, Allan R.; Singh, Surendra.** Minimum recording times for determining short-term seismicity from microearthquake activity: Seismol. Soc. America Bull., v. 58, no. 2, p. 639-644, illus., table, 1968.

The minimum microearthquake recording time needed to determine short-term seismicity (10 years) has been established for regions having the same degree of activity as Socorro, N. Mex. (400 shocks with $M \geq 0$ each year). An analysis of more than five years of microearthquake data indicates that about six months of recording are required for a reliable estimate of the earthquake-frequency relation from which seismicity is calculated. If the slope b of the earthquake-frequency law is assumed, the short-term seismicity can be determined from four weeks of recording. The danger in the latter method is that a small error in b leads to relatively large errors in seismicity. Long-term seismicity (100 years) predicted from the present level of microearthquake activity in Socorro is much lower than the known seismicity of the region.—*from* Authors' abstract

Sansores, Enrique. *See* Benavides G., Luis. 01014

00842 **Sauer, Emil Karl.** The application of geotechnical principles in road design problems [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 7, p. 2835B-2836B, 1968.

06790 **Savage, E. Lynn.** The Triassic sediments of Rockland County, New York [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 6, p. 2486B, 1967.

06928 **Savarenskiy, Ye. F.; Kosarev, G. L.** Tsifrovaya fil'tratsiya dlinnoperiodnykh kolebaniy Alyaskinskogo zemletryaseniya 1964 g.: Akad. Nauk SSR Izv. Fizika Zemli 1967, no. 12, p. 57-59, illus., 1967.

The stations of the Russian seismic network are not yet equipped with long-period seismographs, so it is difficult to interpret the seismograms of strong earthquakes like the Alaskan earthquake of 1964, in the long-period surface-wave range. This note shows how digital filtering can be accomplished with the aid of a computer, to suppress the comparatively short-period waves and amplify those with periods of more than 100 sec. The algorithm of this filtering is based on the use of the theorem on convolution of two functions of a "weight" function and of the recorded vibration. This filtering was applied to data of the Alaskan earthquake; it was found that for periods of 210-360 sec the experimental curve corresponded to the theoretical curve calculated for the Gutenberg-Bullen A model Earth; for longer periods the observed velocities were somewhat lower than the theoretical.—DBV

00833 **Sayers, Robert W.; Tippett, M. C.; Fields, Edward D.** The copper deposits at Copper Canyon and Copper Basin, Lander County, Nevada [abs.]: Econ. Geology, v. 63, no. 1, p. 90-91, 1968.

00994 **Schafer, J. P.** Surficial geologic map of the Ashaway quadrangle, Connecticut-Rhode Island: U.S. Geol. Survey Geol. Quad. Map GQ-712, scale 1:24,000, 1968.

06936 **Schlicker, Herbert G.; Deacon, Robert J.** Engineering geology of the Tualatin Valley region, Oregon: Oregon Dept. Geology and Mineral Industries Bull. 60, 103 p., illus., tables, geol. map, 1967.

The project area, in the northern Willamette Valley, is characterized by wide, flat lowlands and prominent uplands trending north or northwest, and controlled by folding and faulting. Rock units range from middle Eocene to early Quaternary. Columbia River basalt forms the bedrock in most of the mountain area and underlies the valley at varying depths. Silts and lacustrine deposits overlie the rock units, with terrace gravels and alluvium along streams. Ferruginous bauxite has been explored at two localities. Engineering characteristics of soils and rock units; geologic hazards; construction materials, including locations and laboratory data; ground water resources; and pollution problems are discussed. Geologic cross sections, a geologic hazards map, and a map showing depth to the Columbia River Basalt under the valley, as well as a geologic map, accompany the report.—ESL

01027 **Schlocker, J.** Petrology and mineralogy of salt and cap rock at Tatum dome, Lamar County, Mississippi [abs.], *in* Saline deposits—Internat. Conf. Saline Deposits, Houston, Tex., 1962, Symposium: Geol. Soc. America Spec. Paper 88, p. 539, 1968.

Schnepfe, Marian M. *See* Grimaldi, F. S. 00774

Schnoes, H. K. *See* Huag, Pat. 00914

01061 **Scholz, C. H.** Mechanism of creep in brittle rock: Jour. Geophys. Research, v. 73, no. 10, p. 3295–3302, illus., 1968.

A review of the experimental evidence suggests that creep in brittle rock at low temperature is due to time-dependent cracking. A transient creep law is derived from the mechanism of time-dependent cracking in an inhomogeneous brittle material. The behavior is described as a Markov process with a stationary transition probability that is obtained from experimental observations of static fatigue in glasses. The model is compared with experimental observations and found to predict the observed stress dependence of creep.—Author's abstract

00936 **Schroeder, Marvin L.** Lower Triassic foraminifera from the Thaynes Formation in southeastern Idaho and western Wyoming: Micropaleontology, v. 14, no. 1, p. 73–82, illus., 1968.

Approximately 600 specimens of arenaceous foraminifera have been recovered from insoluble residues of limestones from the Lower Triassic Thaynes Formation in southeastern Idaho and western Wyoming. Most of the ten species, four of which are new, belong to genera which are far-ranging in age. This is the second reported occurrence of foraminifera from the Lower Triassic in the western hemisphere.—Author's abstract

06892 **Schwarzacher, W.** Some experiments to simulate the Pennsylvanian rock sequence of Kansas, *in* Computer applications in the earth sciences—Colloquium on time-series analysis: Kansas Geol. Survey Computer Contr. 18, p. 5–14, illus., table, 1967.

Power spectra calculated of a simplified lithological section, compiled from R. C. Moore's data for Kansas, show that quasiperiodicity is a characteristic feature of cyclothem deposition. Such oscillating series can be generated only by a second or higher order process. Either autoregression coefficients or transition probabilities of the series may be estimated. Both may be used as a model; they are compared with reality by calculating the power spectra from simulated runs. The simplest model that gives reasonable agreement is a two-stage Markov chain. To go from one stage into the next, transition probabilities are used that depend on lithologies found 155 feet below this stage in the section. The time lag of 155 feet is the dominant wavelength in the spectrum of the Kansas section.—*from* Author's abstract

Scott, James G. *See* Carroll, Roderick D. 00792

00947 **Scott, R. L.** The exploratory significance of gravity in the Anadarko Basin: Shale Shaker, v. 18, no. 7, p. 132–150, illus., 1968.

This basin, in western Oklahoma, Texas Panhandle, and southern Kansas, has a broad northern shelf and deep southern trough. Recent gas discoveries have created demand for exploratory geophysics to locate pre-Mississippian structural traps. Problems in the basin are: steep gradient in the transition area along the frontal fault, Blaine anhydrite facies features, surface deposits, and migration of structure with depth. Gravity expression of structure is caused primarily by pre-Mississippian density contrasts. Examples given are Carter-Knox field, Overbrook anticline in the Ardmore basin, and Gageby Creek field. Local structural interpretations discussed are West Greensburg Aledo, Elk City, and North Custer City areas. Gravity measurements are capable of yielding more specific structural information than are standard mathematical techniques.—ESL

See, Paul D. *See* Baars, D. L. 01075

Seed, H. Bolton. *See* Peacock, William H. 00987

Shacklette, Hansford T. *See* Cannon, Helen L. 01034

00779 **Shapiro, Leonard; Massoni, C. J.** Automatic sample changer for atomic absorption spectrophotometry, *in* Geological Survey research 1968, Chap. B: U.S. Geol. Survey Prof. Paper 600-B, p. B126-B129, illus., 1968.

An automatic sample changer is described that sequentially carries 64 beakers to the intake aspirator tube of atomic absorption instruments. The aspirator tube is lowered into each beaker, in turn, and the measurement-printout circuitry is pulsed after a suitable pause. When instruments having printout capability are used, the time for the entire cycle is 45 seconds per sample.—Authors' abstract

01077 **Sharp, Robert P.** Sherwin till-Bishop tuff geological relationships, Sierra Nevada, California: Geol. Soc. America Bull., v. 79, no. 3, p. 351-363, illus., 1968.

A glacial till underlies the Bishop tuff, but it has not been established heretofore on firm geological bases that this is the Sherwin till. Relationships here described demonstrate that the till beneath the Bishop tuff is indeed Blackwelder's-type Sherwin. Radiometric datings of the basal pumice of the Bishop tuff by Dalrymple and others yield an age of 710,000 years. Judging from pre-pumice weathering, the till may be still older, perhaps 750,000 years. These considerations make the Sherwin till-Bishop tuff relationship an important reference datum in the continental Pleistocene sequence of North America.—Author's abstract

01039 **Shaw, H. R.; Wright, T. L.; Peck, D. L.; Okamura, R.** The viscosity of basaltic magma—An analysis of field measurements in Makaopuhi lava lake, Hawaii: Am. Jour. Sci., v. 266, no. 4, p. 225-264, illus., tables, 1968.

The methods of rotation viscometry have been applied in the field to a tholeiitic lava at 1130° to 1135°C containing about 25 percent crystals and 2 to 5 percent gas bubbles, using a stainless steel spindle inserted through the lava crust. The results agree well with the Bingham model. Yield values in the lava are 1200 and 700 dynes cm^{-2}, and the plastic constants are 6500 and 7500 poises. Laboratory studies in silicone fluid show gas bubbles enhance plastic behavior. In general, lavas must be treated as non-Newtonian fluids; the conditions that may cause different types of fluid behavior in tholeiitic lava are outlined.—*from* Authors' abstract

01020 **Shaw, William S.; Blanchard, J. D.** Salt deposits of the Maritime Provinces of Canada [abs.], *in* Saline deposits—Internat. Conf. Saline Deposits, Houston, Tex., 1962, Symposium: Geol. Soc. America Spec. Paper 88, p. 414-415, 1968.

06828 **Shay, Creighton T.** Vegetation history of the southern Lake Agassiz basin during the past 12,000 years, *in* Life, land and water—Conference on environmental studies of the Glacial Lake Agassiz region, 1966, Proc.: Manitoba Univ. Dept. Anthropology Occasional Paper 1, p. 231-252, illus., table, 1967.

In response to climatic warming, *Populus*, birch, elm, pine, and oak expanded or migrated into the region between 10-11,000 years ago; they were not uniformly distributed. Beginning about 9,000 years ago, the expansion of pine into the area was interrupted by the increase of prairie, suggesting a shift to drier conditions; by 8,500 years ago, as Lake Agassiz II was retreating, prairie was dominant in the lowlands and savannah was dominant in the uplands. Shortly before 4,000 years ago, the climate again became favorable for deciduous forests; jack and red pine appeared in the area about 1,000 years ago.—*from* Author's abstract

00912 **Shelton, John W.** Role of contemporaneous faulting during basinal subsidence: Am. Assoc. Petroleum Geologists Bull., v. 52, no. 3, p. 399-413, illus., 1968.

A study of faulting in the Los Angeles, Hanna, and Ardmore basins, and in the Ouachita and Gulf Coast geosynclines, indicates that most depositional basins subside primarily by contemporaneous faulting. Subsidence occurs along faults originating in the basement, and movement along them proceeds regardless of depositional framework. Faults affecting only the sedimentary fill of a geosyncline form in brittle sediments where they overlie a thick sequence of ductile beds.—WCC

Sheridan, Douglas M. *See* Wrucke, Chester T. 00787

01142 **Sheridan, Douglas M.; Taylor, Richard B.; Marsh, Sherman P.** Rutile and topaz in Precambrian gneiss, Jefferson and Clear Creek Counties, Colorado: U.S. Geol. Survey Circ. 567, 7 p., illus., tables, 1968.

Disseminated rutile and major amounts of topaz have been identified in Precambrian topaz–quartz gneiss northwest of Evergreen, Colo. The rutile occurs in quartz–topaz–sillimanite gneiss that forms a stratigraphic unit which is 11 to 100 feet thick and is identified along strike for more than 7,000 feet. Three composite chip samples taken across this unit contain 2.2 to 4.2 percent of rutile, by weight, in grains averaging from 0.1 to 0.3 mm in size. The topaz content, by weight, in the same samples ranges from 23 to 67 percent.—Authors' abstract

01115 **Shlichta, Paul J.** Growth, deformation, and defect structure of salt crystals, *in* Saline deposits—Internat. Conf. Saline Deposits, Houston, Tex., 1962, Symposium: Geol. Soc. America Spec. Paper 88, p. 597–617, illus., table, 1968.

Growth and deformation are governed by and cause defects in structure. Lattice defects and their geological applications are reviewed. Salt-crystal growth from brine is very sensitive to growth conditions. The resulting veils and impurity bands and (or) color centers can be used as microvarves to correlate deposition periods and, when used with trace-element analysis, brine analysis, and other defect studies, to determine conditions of deposition. Most salt crystal idiosyncrasies can be explained in terms of dislocation phenomena. The behavior of polycrystalline salt is understood by these considerations also. Many techniques are time consuming and expensive, and may only apply locally, but there may be instances when these crystal-defect studies will form a valuable adjunct to conventional field methods.—*from* Author's abstract

01021 **Shoemaker, Eugene M.; Elston, Donald P.** Structure and history of the salt anticline of the Paradox Basin, Colorado and Utah [abs.], *in* Saline deposits—Internat. Conf. Saline Deposits, Houston, Tex., 1962, Symposium: Geol. Soc. America Spec. Paper 88, p. 415–416, 1968.

01117 **Short, N. M.** Failure of rock salt by explosive loading at the Winnfield Salt Mine, Louisiana, *in* Saline deposits—Internat. Conf. Saline Deposits, Houston, Tex., 1962, Symposium: Geol. Soc. America Spec. Paper 88, p. 631–641, illus., 1968.

The effects of a chemical explosion were examined by carefully stripping away the salt from around the detonation cavity. This revealed a distinctive pattern of carbon-filled radial fractures and separate sets of conical fractures extending above and below the cavity. Salt underwent plastic adjustment adjacent to the cavity and was accompanied by extensive microfracturing. The fracture patterns around the contained explosion are compared to those in the walls of a 12-ft diameter sphere, hollowed out of salt to provide a decoupling chamber. Explosions at the center of the sphere caused numerous intersecting fractures that extend out to a total wall depth of less than two feet.—*from* Author's abstract

Short, N. M. *See* Mattox, Richard B. 01119

Shouldice, J. R. *See* DeMille, George. 01016

01164 **Shreve, Ronald L.** Leakage and fluidization in air-layer lubricated avalanches: Geol. Soc. America Bull., v. 79, no. 5, p. 653–657, illus., 1968.

Air-layer lubrication, that is, nearly frictionless support on a layer of trapped and compressed air, has been suggested for the Blackhawk-type landslides and for some *nuées ardentes*, snow avalanches, and cratering fallback. To insure a sufficiently small rate of air loss by leakage through a typical Blackhawk-type landslide, the harmonic mean permeability must be less than about 1 darcy, a value that is reasonable for the extremely poorly sorted debris involved. A further necessary requirement for air-layer lubrication to occur, rather than simultaneous deposition and fluidization, is that the product of the permeability and the bulk density of the basal debris be less than 0.7 times the product of the harmonic mean permeability

and the arithmetic mean density for the debris as a whole, as is probably in fact the case in these landslides.—Author's abstract

Shriram, Calcutta R. *See* Dickey, Parke A. 01089

00864 **Shroder, John Ford, Jr.** Landslides of Utah [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 7, p. 2907B, 1968.

00965 **Simon, Ruth B.** Remarks on a paper by H. Freedman, "Estimating earthquake magnitude" [1967]: Seismol. Soc. America Bull., v. 58, no. 2, p. 745–746, 1968.

The article by Freedman (ibid., v. 57, no. 4, p. 747–760, 1967) criticizes the method presently used by the U.S. Coast and Geodetic Survey, in which observations are combined for magnitude determinations, and suggests an alternative statistical method. The latter may be useful in handling great numbers of earthquakes in which computerized data are homogenized and distributed for public information, but the inconsistencies eliminated by the statistical approach are in fact highly significant in the study of the Earth, which is the main object of seismology. The lumping together of all magnitudes for a "mean" magnitude, or the statistical weighting of certain groups of reports, will not necessarily give a "true" magnitude of any particular earthquake, or yield new information about the Earth's behavior.—DBV

Simoneit, B. R. *See* Burlingame, A. L. 01098

00897 **Simpson, George Gaylord.** The cochlea in multituberculates [discussion of paper by S. O. Landry, Jr., 1967]: Systematic Zoology, v. 17, no. 1, p. 98, 1968.

In reply to the statement of Landry in "Disappearance of multituberculates" (ibid., v. 16, no. 2, p. 172–173, 1967) that he has never found a description of the cochlea, Simpson furnishes references for descriptions of the cochlea of *Ptilodus* by Broom (1940) and himself (1937).—VMJ

Singewald, Q. D. *See* Brock, M. R. 00992

Singh, Surendra. *See* Sanford, Allan R. 00953

06906 **Sirkin, Leslie A.** Late-Pleistocene pollen stratigraphy of western Long Island and eastern Staten Island, New York, *in* Quaternary paleoecology—Internat. Assoc. Quaternary Research, 7th Cong., 1965, Proc., V. 7: New Haven, Conn., Yale Univ. Press, p. 249–274, illus., tables, 1967.

Bog sediment–pollen studies were made on the Harbor Hill moraine. The oldest zone, W2a, is from tundra-like plants, whereas zone W2b shows tundra to be established to the north of the moraine a bit later. Zone W3, even younger, signifies a park–tundra vegetation. The absence of W2 at the northernmost bog supports an ice-stand hypothesis. The pattern of progressive disappearance of W zones northward on the bog sediments is used to show the pattern of glacial recession. Younger pollen zones correlate with those elsewhere in eastern North America. The T, A, B, and C zones correlate with southern New England. The W zones correlate with the V3 and V4 zones on Martha's Vineyard, and the F1 and F2 of Pennsylvania. A W1 may be present.—*from* Author's abstract

06867 **Skinner, Brian J.** Precipitation of Mississippi Valley-type ores—A possible mechanism, *in* Genesis of stratiform lead-zinc-barite-fluorite deposits (Mississippi Valley type deposits)—A symposium, New York, 1966: Econ. Geology Mon. 3, p. 363–369, 1967.

A simple, obvious mechanism for the deposition of the Mississippi Valley-type sulfide ores is proposed. Rising hot brines, carrying heavy metals in solution as chloride complexes, cause the thermal degradation of the sulfur-containing organic compounds found in all organic matter, and particularly in petroliferous materials. The thermal degradation slowly releases sulfur, probably as H_2S, which causes the Mississippi Valley-type sulfide ores to be precipitated.—Author's abstract

00960 **Skinner, R.** Regional geology, *in* A preliminary study of the Moose River belt, northern Ontario: Canada Geol. Survey Paper 67–38, p. 3–6, geol. map, 1968.

The northwestern part of the area, underlain by Devonian and Cretaceous rocks on which a coastal plain is developed, is separated from the southeastern flat clay plain by a low Precambrian escarpment up to 20 mi wide. The whole is mantled by glacial till and marine deposits. Granulitic gneisses underlie the north-northeasterly trending aeromagnetic anomaly and appear to be associated with the Kapuskasing gravity high. A magnetic anomaly west of this belt is underlain by granite gneiss. Pyroxenite dikes underlie northeast-trending magnetic anomalies and diabase dikes cut all Precambrian rocks. A northerly striking fault west of the North French River is indicated; the divergent trend of the major magnetic anomaly, the higher grade of metamorphism, and the presence of basic rocks suggest that it is a major structural feature in which a deeper part of the crust is exposed.—ESL

00996 **Skipp, Betty; Hepp, Mary-Margaret.** Geologic map of the Hatfield Mountain quadrangle, Gallatin County, Montana: U.S. Geol. Survey Geol. Quad. Map GQ-729, scale 1:24,000, section, text, 1968.

Overturned disharmonic folds trend N–NE through the length of the Hatfield Mountain quadrangle; to the north folds trend north, and to the south their trend changes abruptly to northwest. Rocks exposed range from Devonian through Late Cretaceous. Erosional unconformities are present between Mississippian and Pennsylvanian formations, and between Pennsylvanian and Jurassic. A disconformity exists between the Cretaceous Eagle Sandstone and the Livingston Group equivalent; there is no indication of any large structural angularity. Major folding and faulting took place after deposition of the Upper Cretaceous Livingston Group equivalent. Late Paleocene deformation involved concentric folding, reverse faulting, and disharmonic folding. Trends of the large folds change abruptly from northeast to northwest at the south boundary.—MCM

06952 **Slaughter, Bob H.** Animal ranges as a clue to Late-Pleistocene extinction, *in* Pleistocene extinctions—The search for a cause—Internat. Assoc. Quaternary Research, 7th Cong., 1965, Proc., V. 6: New Haven, Conn., Yale Univ. Press, p. 155–167, illus., 1967.

Animals whose geologic ranges extend back into the Pleistocene have modern ranges established at about the same time as the last major period of extinction (9,000–8,000 B.P.). If we conclude that climate is the primary range-restricting element, we must also conclude that essentially modern climate formed modern (or at least historic) ranges. I believe it to be too coincidental that the formation of essentially modern climate took place during this major period of extinction; the two events are probably related. I suggest that one of the pressures on many animals was their inability to adapt their mating habits to the changing climate. Extinction seems to have been selective toward animals with relatively long periods of gestation—not dependent on the size of the animals, as is often stated.—*from* Author's abstract

Slawson, W. F. *See* Russell, R. D. 06870

00806 **Smith, A. Richard.** Distribution of caves in Texas: Texas Caver, v. 13, no. 1, p. 3–6, illus., table, 1968.

Factors important in localization of caves in Texas—variations in kinds of rock, solubility and ease of erosion, fracturing and folding, amount of rainfall, and physiography—are summarized. Based on these factors, the State is divided into nine speleological regions: Comanche Plateau, Balcones fault zone, Guadalupe-Blanco area, Llano region, Edwards Plateau (eastern and western divisions), Big Bend, reef mountains, Gypsum Plain, and northwest Texas.—ESL

Smith, A. Richard. *See* Quinlan, James F. 06773

Smith, A. Y. *See* Dyck, Willy. 01081

Smith, Avery E. *See* Goudarzi, Gus H. 00993

01022 **Smith, Joe P.** Salt crusts and brines near Carlsbad, New Mexico [abs.], *in* Saline deposits—Internat. Conf. Saline Deposits, Houston, Tex., 1962, Symposium: Geol. Soc. America Spec. Paper 88, p. 416, 1968.

00865 **Smith, Robert Baer.** A regional gravity survey of western and central Montana [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 7, p. 2907B–2908B, 1968.

Smout, A. H. *See* Eames, F. E. 01042

06855 **Sneath, P. H. A.** Quality and quantity of available geologic information for studies in time, *in* Computer applications in the earth sciences—Colloquium on time-series analysis: Kansas Geol. Survey Computer Contr. 18, p. 57–61, tables, 1967.

In numerical biological fields it is difficult to select minimum best data, or to sift much without sacrifice in quality. With sedimentary rock time sequences, a method of cross-association (Sackim, Sneath, and Merriam, 1965) analogous to cross multiple correlation—essentially sliding one section past another to count opposite matching variables at trial positions, ignoring strata thickness—seems capable of detecting periodic or cyclic phenomena. For example in the Kansas City Group, Pennsylvanian, 30 rock units were recorded in average or better detail, and 36 descriptors were found reasonably accurate and complete; matching probability is about 73 percent; standard deviations in short subsections run against the reference section had some values that might be misleading. Remarkable results with cross-correlation of tree rings and varves are cited.—GDC

06880 **Snyder, Frank G.** Criteria for origin of stratiform ore bodies with application to southeast Missouri, *in* Genesis of stratiform lead-zinc barite fluorite deposits (Mississippi Valley type deposits)—A symposium, New York, 1966: Econ. Geology Mon. 3, p. 1–12, illus., tables, 1967.

Proponents of syngenetic theory base their interpretation on widespread uniform mineralization within a restricted stratigraphic interval and a consistent relationship of mineralization to sedimentary features, and of epigenetic theory on mineralization of post-depositional structures, changes in extent and grade of ore, open space filling, lack of close control by sedimentary features, and relation of ore to tectonic structures. On the basis of diagnostic criteria defined the major lead-zinc deposits of Midcontinent United States must be epigenetic. The metals of southeastern Missouri were derived from nearby sedimentary basins and carried out of basins onto shelf areas in a concentrated brine. Movement of solutions was controlled by basement topography and deposition of metals occurred when solutions entered the Bonneterre formation on the flanks of and over buried knobs.—*from* Author's abstract

06798 **Song, Byong-Mu.** A study of fundamental engineering characteristics of Recent and Pleistocene marine sediments of Sabine Pass area, Gulf of Mexico [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 6, p. 2421B, 1967.

Sorensen, F. H. *See* Ballard, J. Alan. 00930

00950 **Spencer, Edgar W.** Geology of the Natural Bridge, Sugarloaf Mountain, Buchanan, and Arnold Valley quadrangles, Virginia: Virginia Div. Mineral Resources Rept. Inv. 13, 55 p., illus., tables, geol. maps, 1968.

The quadrangles include portions of the Blue Ridge and Valley and Ridge provinces. Drainage changes were involved in the origin of Natural Bridge. Stratigraphy ranges from the Precambrian Virginia Blue Ridge Complex to the Devonian Brallier Formation, and relationships are complicated by imbricate thrust sheets and faulted folds. Precambrian and Lower Cambrian units moved westward along several thrusts, narrowing the Appalachian Valley until, in the Buchanan area, Precambrian and Silurian are less than 2 1/2 miles apart. In the Arnold Valley area, a window in the Precambrian exposes Middle Cambrian Erwin and Shady Formations. In the southwest, Cambrian units are west of ridge-forming Silurian and Devonian

rocks, a displacement of over eight miles. Limestone, dolomite, and clay are being produced at present, and iron and manganese have been mined in the past.—ESL

01023 **Sproule, J. C.** Evaporite deposits of the Canadian Arctic Islands [abs.], *in* Saline deposits—Internat. Conf. Saline Deposits, Houston, Tex., 1962, Symposium: Geol. Soc. America Spec. Paper 88, p. 416–417, 1968.

Sreekumaran, C. *See* Folsom, T. R. 01152

Srivastava, G. S. *See* Rao, S. V. L. N. 06883

Srivastava, S. K. *See* Binda, P. L. 00909

00988 **Starr, Michael Reginald.** Use of computers for slope stability analysis—Discussion [of paper 5327 by R. V. Whitman and W. A. Bailey, 1967]: Am. Soc. Civil Engineers Proc., v. 94, paper 5922, Jour. Soil Mechanics and Found. Div., no. SM3, p. 784–789, illus., table, 1968.

The version of the Morgenstern–Price computer program now used in Britain gives almost as much information about internal forces in the potential sliding mass as may be desired ideally. Whitman and Bailey's (ibid., v. 93, no. SM4, p. 475–498) qualification that the vertical slice is not necessarily the most critical still applies. Answers for the vertical factor of safety where a slice comprises one or several soil types can be tested by whether the line of thrust is wholly within the section, and whether the vertical factor of safety is everywhere greater than one. A cross section and studies of Mangla Dam are used to illustrate computer use.—ESL

00801 **Steven, T. A.; Friedman, Irving.** The source of travertine in the Creede Formation, San Juan Mountains, Colorado, *in* Geological Survey research 1968, Chap. B: U.S. Geol. Survey Prof. Paper 600-B, p. B29–B36, illus., table, 1968.

The Creede Formation and its included travertine were deposited in a closed basin around the periphery of the Creede caldera shortly after final subsidence and resurgent doming of the caldera core. Geologic and isotopic evidence favors derivation of the carbonate in the travertine by upwelling resurgent magma intruding or approaching a sedimentary carbonate unit, and remobilizing the calcium carbonate by some process related to contact metamorphism or solution and replacement.—Authors' abstract

06955 **Stevenson, I. M.** Geology, Minipi Lake, Newfoundland: Canada Geol. Survey Prelim. Ser. Map 6–1967, scale 1:253,440, text, 1967.

Criteria of glaciation in the Minipi Lake map-area—outwash plains, drumlin fields, thick ablation moraine, and eskers—are everywhere abundant; relief is moderate, with resistant rock types locally forming rounded hills. In general, rocks of the anorthosite suite are more prominent than those of the gneisses and granites that have a more subdued topography. Glacial deposits have effectively obliterated most evidence of structural deformation. No mineralization of economic importance was recognized.—MCM

00911 **Stewart, John H.; McKee, Edwin H.** Favorable areas for prospecting adjacent to the Roberts Mountains thrust in southern Lander County, Nevada: U.S. Geol. Survey Circ. 563, 13 p., illus., table, geol. maps, 1968.

Recent geologic mapping by the U.S. Geological Survey of more than 2,500 sq mi of a relatively little-studied part of central Nevada has outlined four areas favorable for the discovery of metallic mineral deposits. In these areas, lower Paleozoic carbonate rocks crop out below the Roberts Mountains thrust, a widespread fault in central and north-central Nevada. These areas have a stratigraphic and structural setting similar to that of the areas where large, open-pit gold deposits have been discovered recently at Carlin and Cortez in north-central Nevada.—Authors' abstract

Stoiser, Lee R. *See* Wells, John D. 00839

06850 **Stone, Richard O.** A desert glossary: Earth-Sci. Rev., v. 3, no. 4, p. 211–268, illus., 1967.

The vocabulary describing desert features and desert phenomena is vast and, in various respects, repetitious. This paper presents a compilation of current terms with the intention to assist individuals interested in deserts to more easily understand published information and to provide a single source which can be enlarged in the future.—Author's summary

Strangway, David W. *See* McMahon, Beverly E. 01086

Struxness, E. G. *See* Bradshaw, R. L. 01118

00903 **Stueber, A. M.; Huang, W. H.; Johns, W. D.** Chlorine and fluorine abundances in ultramafic rocks: Geochim. et Cosmochim. Acta, v. 32, no. 3, p. 353–358, table, 1968.

Fifty-five ultramafic rocks of various modes of occurrence have been analyzed for Cl and F by a rapid spectrophotometric method. The different modes of occurrence seem to have different abundance levels of Cl and F, but this may be due to secondary effects. It is suggested that the amounts of primary Cl and F in all ultramafic rocks are most nearly represented by the abundance levels found in ultramafic inclusions in basalts. The study indicates that a downward revision of previously compiled Cl and F abundances in ultramafic rocks would be necessary if serpentinization is not a magmatic process.—KAS

Swanson, Donald A. *See* Walker, George W. 00772

01163 **Swift, Donald J. P.; Lyall, Anil K.** Reconnaissance of bedrock geology by sub-bottom profiler, Bay of Fundy: Geol. Soc. America Bull., v. 79, no. 5, p. 639–645, illus., table, 1968.

Reconnaissance with a sub-bottom profiler has revealed the structural plan of the largely submarine Acadian Triassic Basin in the Bay of Fundy. The Bay is floored mainly by Triassic clastic rocks which have been warped into a broad syncline. The basalt of the North Mountain–Cape Split–Cape Blomidon cuesta may be traced underwater as far as Quaco Ledge, defining the northeastern limb of the Fundy syncline. The basin's northwestern margin is a zone of normal faults, from 2 to 10 km seaward from the shore. While the basin is, therefore, technically a half-graben, the central syncline is the dominant structure.—Authors' abstract

06875 **Szabo, Michael W.** Sand and gravel in Alabama—A summary report: Alabama Geol. Survey Circ. 44, 41 p., illus., tables, 1967.

Sand and gravel, essential raw materials for construction and manufacturing industries, are of growing importance to Alabama's rapidly expanding economy. Of the approximately 6.5 million tons produced by more than 70 commercial mining operations in 1965, about 95 percent was used by the construction industry and about 5 percent by the metal industries. Sand and gravel of economic significance occurs in the Weisner Quartzite; Hartselle Sandstone; Pottsville Formation; Tuscaloosa Group; Eutaw, Ripley, and Nanafalia Formations; Tuscahoma Sand; Tallahatta, Lisbon, and Citronelle Formations; and coastal, beach, and Recent alluvial deposits.—*from* Author's abstract

01093 **Szalay, Frederick S.** The beginnings of primates: Evolution, v. 22, no. 1, p. 19–36, illus., 1968.

This study of the insectivore-primate transition, based chiefly on teeth, indicates that one of three groups may have been ancestral to the primates during the Late Cretaceous: unknown stocks of leptictids, unknown stocks of erinaceoids, or primitive condylarths. Most of the fossil forms studied are from western interior U.S. Teeth and other parts of the feeding mechanism show evolutionary trends indicating a shift from a predominantly insectivorous diet toward a frugivorous-herbaceous diet. The Apatemyidae and Tupaiidae are considered derived independently from the insectivores, not from the primates. The Paleocene

picrodontids, extremely specialized fruit eaters, were probably derived from early primates.—VMJ

Tai, Tein-Lie. *See* Vesić, Aleksandar S. 06932

Takagi, J. *See* Tanaka, S. 01062

00968 **Takeuchi, Hitoshi; Hamano, Y.; Hasegawa, Y.** Rayleigh- and Love-wave discrepancy and the existence of magma pockets in the upper mantle: Jour. Geophys. Research, v. 73, no. 10, p. 3349–3350, table, 1968.

The discrepancy between Rayleigh and Love wave information on the Earth's interior may be explained by assuming an anisotropy at some depth in the Earth. It is proposed that this anisotropy is due to the presence of ellipsoidal inhomogeneities in the form of independent magma pockets. Their volume fraction calculated here (less than 5 percent) is reasonable from a petrological point of view; the volume fraction of partial melting necessary to obtain basalt from upper mantle material is less than five percent. It is interesting that there is no Rayleigh- and Love-wave discrepancy for the Canadian Shield; it may be that there is almost no magma pocket in the crust and mantle under the shield.—DBV

06776 **Tamplin, Morgan J.** A brief summary of Glacial Lake Agassiz studies, *in* Life, land and water—Conference on environmental studies of the Glacial Lake Agassiz region, 1966, Proc.: Manitoba Univ. Dept. Anthropology Occasional Paper 1, p. 27–36, illus., 1967.

This summary includes brief annotations from reports and a general historical account of the geological work in and around Lake Agassiz. The lake was first recognized by Warren, in 1868, and examined in detail and named Upham in the 1880's. Tyrrell was the first Canadian who investigated the beaches in Manitoba in the 1880's. In 1909 Leverett recognized several stages, associated with different ice advances. The controversy between Johnston and Upham, the work of Antevs, and that of many different soil-scientists is reviewed. The use of aerial photographs and C-14 dating have permitted greater detail to be known, and numerous stages of the lake are recognized now.—HRC

01062 **Tanaka, S.; Sakamoto, K.; Takagi, J.; Tsuchimoto, M.** Search for aluminum-26 induced by cosmic-ray muons in terrestrial rock: Jour. Geophys. Research, v. 73, no. 10, p. 3303–3309, illus., tables, 1968.

Terrestrial Al-26 produced by cosmic-ray muons has been sought in silicate rock. Aluminum was isolated and purified from tens of kilograms of chert obtained from an area with a low erosion rate. Al-26 was counted with a low-level gamma-gamma coincidence spectrometer. The specific activity for the present surface rock has been measured to be (0.02 ± 0.12) dpm per 10 kg SiO_2, and the specific activity for the rock at a depth of 24 m of water equivalent, to be (0.00 ± 0.08) dpm per 10 kg SiO_2. The Al-26 activity in terrestrial rocks has been limited to 0.01 dpm per 10 kg SiO_2.—Authors' abstract

00900 **Tandon, H. L. S.; Cesca, M. P.; Tyner, E. H.** An acid-free vanadate-molybdate reagent for the determination of total phosphorus in soils: Soil Sci. Soc. America Proc., v. 32, no. 1, p. 48–51, illus., tables, 1968.

An acid-free vanadate-molybdate reagent was developed for the spectrophotometric determination of P in $HClO_4$ digests of soils. The optimum acidity in the analysis is derived from the residual acidity of the $HClO_4$ digests. The method gave highly reproducible results and was not affected by high amounts of Fe^{3+} which is invariably present in soils. The modified reagent greatly simplifies the determination of P and is admirably suited for automated analysis.—*from* Authors' abstract

Taylor, G. C. *See* Rutter,n. W. 00984

00949 **Taylor, John Allen.** Oklahoma City—Its geologic setting: Geotimes, v. 13, no. 4, p. 10–15, illus., 1968.

Within 100 miles of Oklahoma City, Okla., can be found examples of almost every known geologic process, structural event, and sedimentary model, as well as producing petroliferous formations which have made the area a beehive of petroleum exploration and exploitation. Oklahoma lies at the confluence of six major structural arches or mountain systems, all pointing toward the central area of greatest reserves per acre, excepting the northern platform Bartlesville Sand. Early oil and gas discoveries and the past activities of the current giant fields are recalled.—GDC

Taylor, R. E. *See* Mattox, Richard B. 01119

Taylor, Richard B. *See* Sheridan, Douglas M. 01142

Taylor, Robert L. *See* Goodman, Richard E. 01005

Tennant, D. A. *See* Folsom, T. R. 01152

06926 **Terasmae, J.** Postglacial chronology and forest history in the northern Lake Huron and Lake Superior regions, *in* Quaternary paleoecology—Internat. Assoc. Quaternary Research, 7th Cong., 1965, Proc., V. 7: New Haven, Conn., Yale Univ. Press, p. 45–58, illus., 1967.

Deglaciation, about 10,000 years ago, was accompanied by complex, ice-dammed lakes with rapidly changing levels, extents, and outlets. High shorelines show that Lake Algonquin extended into the Lake Superior basin. The Nipissing shoreline at Little Pic River is dated at 5,900 years B.P. Lake Agassiz was in part contemporaneous with Lake Algonquin. Arctic plants at the heads of north-flowing rivers more than 9,000 years B.P. were crowded out by boreal forest shortly afterward, except at local, unique ecological niches. Some boreal species ranged northward to their present limits during the hypsithermal interval, and were followed by considerable expansion of muskeg. Forest fires were significant ecologically.—*from* Author's abstract

06826 **Terasmae, Jaan.** Paleoecology—A practical viewpoint and general considerations, *in* Life, land and water—Conference on environmental studies of the Glacial Lake Agassiz region, 1966, Proc.: Manitoba Univ. Dept. Anthropology Occasional Paper 1, p. 207–215, illus., 1967.

This is a general review of paleoecology with special emphasis upon its relationship to the human environment, the myth of unlimited resources, the water crisis and pollution, the problems of pesticides and conservation, and the search for new natural resources.—HRC

Tester, J. R. *See* Ross, B. A. 00818

Thom, B. G. *See* Adams, R. D. 00925

Thompson, C. E. *See* Nakagawa, H. M. 00778

00780 **Thompson, C. E.; Nakagawa, H. M.; VanSickle, G. H.** Rapid analysis for gold in geologic materials, *in* Geological Survey research 1968, Chap. B: U.S. Geol. Survey Prof. Paper 600-B, p. B130–B132, tables, 1968.

Trace amounts of gold in geologic materials are determined by atomic absorption spectrophotometry of an immiscible organic solvent containing the extracted gold. Samples are dissolved by either hot or cold hydrobromic acid–bromine mixtures. In the hot method the gold in the sample is dissolved by heating with hydrobromic acid and sodium bromate, and in cold method the sample is merely shaken with hydrobromic acid containing 0.5 percent bromine. In both methods, the gold is extracted from the acid solution with methyl isobutyl ketone which is atomized in an atomic absorption spectrophotometer for the estimation. The results compare favorably with those from assay methods. Up to 100 samples a day can be analyzed by the cold method and a sensitivity of 0.02 ppm is attained.—Authors' abstract

00872 **Thompson, C.Sheldon.** Determination of the composition of plagioclase feldspars by means of infrared spectroscopy [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 7, p. 2973B, 1968.

06791 **Tillman, Roderick Whitbeck.** Petrology and paleoenvironments of the Robinson Member, Minturn Formation, Eagle Basin, Colorado [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 6, p. 2486B, 1967.

06792 **Ting, Francis Ta-chuan.** The petrology of the Lower Kittanning coal in western Pennsylvania [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 6, p. 2487B, 1967.

Tippett, M. C. *See* Sayers, Robert W. 00833

01139 **Toewe, E. Clayton.** Magnetometer study in the Leesburg quadrangle: Virginia Minerals, v. 14, no. 2, p. 9–12, illus., 1968.

In this area in northern Virginia, low-rank metamorphic Precambrian and Cambrian rocks—the Catoctin Formation and overlying Weverton quartzites—are separated from interfingering Triassic volcanic-sedimentary units of the Newark Group in the Culpeper basin by a high-angle normal fault. The average percentage of magnetite is: Catoctin, 9.7; diabase, 6.5; mafic pyroclastic rock, 6.5; intermediate pyroclastic rock, 4.0; felsic pyroclastic rock, 2.0; Weverton Formation and Triassic sedimentary rocks, 0.5. A contour map of the total intensity and general geology shows results of 5 east-west magnetic traverses. One cross-section of about 6,000 feet indicates a westerly dip for the Triassic units. Magnetic readings are usually higher where basalt and diabase are close to surface; a small anomalous low was probably caused by lightning.—GDC

00817 **Toomey, Donald Francis; Mamet, B.** Annotated bibliography of Paleozoic nonfusulinid Foraminifera, Addendum 5: Cushman Found. Foram. Research Contr., v. 19, no. 2, p. 41–69, illus., 1968.

This addendum includes 150 annotated references pertaining to Paleozoic nonfusulinid Foraminifera, and can be considered reasonably complete through the year 1966. As in previous bibliographies (Toomey 1959, 1961, 1963, 1965, 1966, and Toomey and Mamet, 1967), the aims are: (1) to summarize briefly the pertinent data contained in each article, (2) to list all new genera and species described therein, and (3) to denote, by brackets, all taxonomic changes noted from current and subsequent publications, thus making the bibliography a more useful working tool. An attempt is also made to evaluate the literature to date and possibly delineate trends.—Authors' abstract

00731 **Trainer, Frank W.** Temperature profiles in water wells as indicators of bedrock fractures, *in* Geological Survey research 1968, Chap. B: U.S. Geol. Survey Prof. Paper 600-B, p. B210–B214, illus., 1968.

Wells in the gently dipping Lockport Dolomite in Niagara County, western New York, are characterized by downward flow of water from fractures in the upper part of the rock to deeper fracture zones. Temperature profiles for these wells can be used to determine the vertical distribution of water-bearing fractures because the profiles show inflections which mark the levels of the fracture zones receiving the water. The areal distribution of the fractures can be studied by correlation of these fracture zones from one well to another.—Author's abstract

01050 **Trapp, Henry, Jr.** Geology and ground water resources of Eddy and Foster Counties, North Dakota—Pt. 3, Ground water resources: North Dakota Geol. Survey Bull. 44, pt. 3 (North Dakota Water Comm. County Ground Water Study 5), 110 p., illus., tables, 1968.

The Counties have substantial water resources in glacial-drift aquifers; only a small part has been developed. The New Rockford and Carrington buried outwash aquifers have the greatest potential, with wells in the latter capable of yielding over 1,000 gpm, and similar yields possible in the former. Surficial outwash aquifers underlie substantial areas but are generally thin; however a well in the Northwest

Eddy aquifer yields over 750 gpm. Water from glacial drift is very hard with dissolved solids and iron usually exceeding recommended limits for drinking water. The Pierre Shale and Dakota Sandstone have been used as aquifers, but the water is slightly saline. [Chemical analyses are tabulated, and maps show elevation of the water table, potential yields, thickness of saturated drift, and transmissibility of drift, along with sections.]—*from* Author's abstract

Treleaven, A. L. *See* Geiger, K. W. 00821

06846 **Tremblay, Germain.** Observations et mesures sur les blocs glaciels du Cap à l'Orignal [with English abs.]: Cahiers Géographie Québec, v. 11, no. 23, p. 402-410, illus., tables, 1967.

Boulders of granite gneiss, quartzite, sandstone, shale, and conglomerate are scattered on the low tide zone; their size and shape are highly variable, exceeding in some cases 3 m in diameter. The percentage of crystalline elements has its maximum in boulders about 1,000 mm in length; a boulder of this size has more chance of being ice-rafted. Boulder-moving action as well as the lining up of the blocks is found to be due to the action of the tide and floating-gripping-and-depositing-ice. Appalachian boulders come from the surrounding cliffs, and crystalline elements from the mouths of boulder-filled rivers, flowing from the Laurentian Shield.—*from* Author's abstract

Trent, V. A. *See* Pipiringos, G. N. 01108

Trexler, J. Peter. *See* Wood, Gordon H., Jr. 01112

00741 **Trumbull, James V. A.; Hathaway, John C.** Dark-mineral accumulations in beach and dune sands of Cape Cod and vicinity, *in* Geological Survey research 1968, Chap. B: U.S. Geol. Survey Prof. Paper 600-B, p. B178-B184, illus., table, 1968.

Accumulations of dark minerals were observed along 23 percent of the shoreline of Cape Cod and vicinity on January 23-24, 1967. The largest single accumulation observed was only 15 cm thick and 6 by 20 m in area. Streams are not effective concentrating agents in the area studied. Wind is an effective agent, but the largest accumulations of dark minerals are wave caused and occur where the largest amounts of sand are in transport along the beach. More dark-mineral accumulations originate from outwash than from till. Material from coastal-plain sediments may form a significant part of the glacial deposits in areas of abundant accumulations.—Authors' abstract

Tsuchimoto, M. *See* Tanaka, S. 01062

06787 **Turner, Francis J.** Some limits of pressure in regional metamorphism as indicated by stability fields of some critical minerals, *in* Étages tectoniques—Colloque de Neuchâtel, Neuchâtel Univ. Inst. Géol., 1966: Neuchâtel, Switzerland, La Baconnière, p. 77-82, illus., 1967.

The most reliable experimental data on stability fields of andalusite, kyanite, and sillimanite indicate that the occurrence of kyanite as a stable member of metamorphic mineral assemblages in pelitic schists need not imply pressures greater than 3-5 kb at temperatures of 400° to 600°C. Lawsonite, aragonite, or jadeite-quartz that crystallize as stable assemblages in glaucophane schists imply pressures greater than 5-10 kb over the temperature range 150° to 300°C.—JPF

06777 **Tuthill, Samuel J.** Paleo-zoology and molluscan paleontology of the Glacial Lake Agassiz region, *in* Life, land and water—Conference on environmental studies of the Glacial Lake Agassiz region, 1966, Proc.: Manitoba Univ. Dept. Anthropology Occasional Paper 1, p. 299-312, illus., tables, 1967.

Three aspects of the paleozoology of the Glacial Lake Agassiz region are discussed here: (1) the nature of the fossil and modern invertebrate record with special emphasis upon the Mollusca, (2) the methods used in past molluscan studies and recommendations for the future, and (3) the data and rationale affecting paleoecologic reconstructions for the region.—*from* Author's introduction

Tyner, E. H. *See* Tandon, H. L. S. 00900

00926 **Uchupi, Elazar.** Atlantic continental shelf and slope of the United States—Physiography: U.S. Geol. Survey Prof. Paper 529–C, p. C1–C30, illus., tables, 1968.

From Nova Scotia to Nantucket Island, the continental shelf has broad basins separated by banks, swells, and ridges. In this zone and the next to the south, the continental slope is deeply entrenched by submarine canyons, and at the foot of the slope is a large sedimentary apron, the continental rise. From Nantucket to Cape Lookout, the shelf is smoother than in the northern zone, but it is disrupted by sand swells, channels, coral mounds, and terraces. In the southern zone, Cape Lookout to the Florida Keys, the continental slope is relatively smooth. Landward is a shelf, a marginal plateau (Blake Plateau), a trough (Straits of Florida), and the Bahama Banks. The Blake Basin and Blake Ridge are seaward of the slope. East of Nantucket, topographic differences are believed to be due to glacial erosion; south of Cape Lookout, to folding or faulting, erosion by the Gulf Stream, and calcareous accretion.—ACS

Uehara, G. *See* Juang, T. C. 00899

01128 **Union Internat. Sciences Géol.** (Commission Géochronologie). Tableau comparatif des échelles géochronologiques récemment publiées pour les temps Phanérozoïques notice explicative: Soc. Géol. Belgique Annales 1966–67, v. 90, Bull. 10, p. B825–B828, tables, 1968.

Absolute geologic time scales developed since 1937 (Holmes 1937 and 1959, Kulp 1960, Afanas'yev and others 1964, and Holmes' symposium 1964) are juxtaposed in a table for comparative purposes and to demonstrate the refinements that have been possible with increasing accuracy and understanding of isotopic dating techniques. A table is given also of the principal orogenic phases (Alpine, Laramide, Caledonian, Assyntic) in the Phanerozoic with major divisions dated on the basis of the most recent geochronologic scales.—VSN

06916 **Univs. Council on Water Resources.** Education in hydrology, United States universities—Early 1966: Austin, Tex., Univ. Texas, 44 p., illus., tables, 1967.

The report presents information on four aspects of hydrology programs felt to be of primary significance in determining the effectiveness of education in hydrology: faculty, courses offered, degree programs, and financial support. A chapter of the report is devoted to each of these topics, and one to a brief summary.—*from* Author's abstract

00796 **U.S. Geological Survey.** Geological Survey research 1968, Chap. B: U.S. Geol. Survey Prof. Paper 600–B, p. B1–B233, illus., tables, 1968.

This collection of 44 short papers represents current work of the U.S. Geological Survey in the fields of mineralogy and petrology, petrography, economic geology, isotope geology, geophysics, geochemistry, analytical methods, paleontology, structural geology and stratigraphy, geomorphology and Pleistocene geology, sedimentation, topographic sketch map series, limnology and surface water, ground water, relation between ground and surface water, land subsidence, and hydrologic instrumentation. Pertinent papers are cited separately. Author and subject indexes are provided.—MCM

01041 **Vance, Joseph A.** Metamorphic aragonite in the prehnite-pumpellyite facies, northwest Washington: Am. Jour. Sci., v. 266, no. 4, p. 299–315, illus., 1968.

Metamorphic aragonite is widely distributed in the San Juan Islands and the adjacent mainland of Washington State in rocks of the lower grade portion of the prehnite–pumpellyite facies. It occurs both in large, recrystallized limestone bodies and as a vein mineral in associated metasedimentary and metavolcanic rocks. The metamorphic facies and stratigraphic evidence indicate formation of the aragonite at low or moderate pressures. It is concluded that this aragonite is either metastable or that the experimental data reflect metastable conditions. These relations raise fundamental questions as to: (1) the reliability of metamorphic aragonite as an

index of high pressure, and (2) the validity of the extreme pressures and especially of the unique geological history assigned to certain rocks of the glaucophane-schist facies on the basis of the occurrence of aragonite.—*from* Author's abstract

00976 **vanEverdingen, R. O.** The influence of the South Saskatchewan Reservoir on the local ground water regime—A prognosis: Canada Geol. Survey Paper 65-39, 85 p., illus., tables, 1968.

The South Saskatchewan River dam will impound a reservoir 140 mi long and 187 feet deep. Piezometers in three Cretaceous sandstone aquifers underlying the reservoir will determine natural ground-water movement, aquifer parameters for a prognosis of future changes in ground-water regime, and actual changes as they occur. Aquifer tests yielded hydraulic conductivity values of 0.1–1.0 in. per hr, storage coefficients between 1×10^{-4} and 3.3×10^{-5}, and barometric efficiency values of 20–40 percent; discharge was calculated to be 214 cu feet per day per 100 ft length of valley. The distribution of increases in total head for the aquifers was determined by an electric analog model. The time needed to reach a new equilibrium will be long for areas not adjacent to the reservoir. Other effects may be waterlogging, increased soil salinity, and improved moisture conditions in some areas.—*from* Author's abstract

01085 **VanHouten, Franklyn B.** Iron oxides in red beds: Geol. Soc. America Bull., v. 79, no. 4, p. 399–416, illus., tables, 1968.

Magnetite and ilmenite are delivered relatively unaltered to nonmarine and paralic environments. In oxidizing areas, inherited grains of oxide begin to alter to black hematite and leucoxene. Oxidation continues long after burial, so that successively older red beds contain relatively more hematite. In reducing environments, inherited oxide grains begin to dissolve. Loss of magnetite increases the relative amounts of ilmenite and black hematite. Muddy alluvium commonly contains brown amorphous and hydrated ferric oxide pigment which dehydrates to red hematite in oxidizing environments. Sandy alluvium acquires hematite pigment largely by postdepositional in situ alteration of iron-bearing silicates. Most detrital red beds possess chemical remanent magnetization.—*from* Author's abstract

VanSickle, G. H. *See* Thompson, C. E. 00780

01141 **VanSickle, Gordon H.; Lakin, Hubert W.** An atomic-absorption method for the determination of gold in large samples of geologic materials: U.S. Geol. Survey Circ. 561, 4 p., tables, 1968.

A laboratory method for determination of gold in large (100-gram) samples has been developed for use in study of the gold content of placer deposits and of trace amounts in other geologic materials. In this method the sample is digested with bromine and ethyl ether, gold is extracted into methyl isobutyl ketone, and the determination is made by atomic-absorption spectrophotometry. The lower limit of detection is 0.005 ppm. The few data obtained so far agree favorably with those obtained by assay and other atomic-absorption methods. About 25 determinations can be made per man-day.—*from* Authors' abstract

VanSiclen, D. C. *See* Mattox, Richard B. 01119

01092 **VanValen, Leigh.** Monophyly or diphyly in the origin of whales: Evolution, v. 22, no. 1, p. 37–41, 1968.

Yablokov (1964) and several previous authors have concluded that the recent suborders of toothed and whalebone whales originated separately from terrestrial animals. It is here demonstrated by comparisons of the known osteological characters of the Odontoceti and Mysticeti with those of the Archaeoceti that, for every character, the possibly congeneric middle Eocene *Protocetus* and *Pappocetus*, the earliest and most primitive known archaeocetes, could be directly ancestral to both recent suborders. The late Oligocene toothed whale *Aetiocetus* is here placed in the Mysticeti because it is similar to them in all respects except for the presence of teeth, a primitive character.—VMJ

06940 **Veitch, John D.** The caves of Alabama—A guide for the 1967 convention of the National Speleological Society, Birmingham and Huntsville, Alabama: Privately printed, 51 p., illus., 1967.

After a resumé of the various types of caves in Alabama, and a brief geological view of the State, 23 outstanding caves in Madison, Jackson, Morgan and Marshall Counties are described, each with a map. One section on cave animals is contributed by John E. Cooper, not cited separately.—GDC

00973 **Vesić, Aleksandar S.; Clough, G. Wayne.** Behavior of granular materials under high stresses: Am. Soc. Civil Engineers Proc., v. 94, paper 5954, Jour. Soil Mechanics and Found. Div., no. SM3, p. 661–688, illus., tables, 1968.

Triaxial tests at mean normal stresses up to 1,200 kg per sq cm on uniform quartz sand show that deformation varies with pressure. As stress increases, crushing is more pronounced and dilatancy gradually disappears. Beyond breakdown pressure, when effects of initial void ratio disappear, sand behaves as a linearly deformable solid with modulus of deformation E proportional to stress q. In the same range, sand strength is characterized by a constant angle of internal friction equal to angle of interparticle friction. Below breakdown pressure, E increases as a power function of q; but the exponent of this function varies with pressure and, to a degree, with initial void ratio. Strength envelopes in this range are curved and depend on initial void ratio. Relative compressibility of granular materials increases with pressure and may be responsible for scale effects in passive pressure phenomena.—*from* Authors' abstract

06932 **Vesić, Aleksandar S.; Boutwell, Gordon P., Jr.; Tai, Tein-Lie.** Engineering properties of nuclear craters—Rept. 6, Theoretical studies of cratering mechanisms affecting the stability of cratered slopes, Phase 3: U.S. Army Corps Engineers Waterways Expt. Sta. Tech. Rept. 3-699, 129 p., illus., tables, 1967.

This third phase of the overall project is devoted to study of cratering phenomena in three specific situations of particular interest in engineering practice: (1) where cratered medium is submerged under the water table, (2) where surface of the cratered medium is sloped, and (3) where several explosive chargers are set off simultaneously in a medium. Chap. 1 is devoted to the experimental study of cratering phenomena in saturated or submerged media. Chap. 2 describes experiments in which pore-fluid stress waves caused by an explosion in a mass of submerged, dense sand were measured and discussed, with particular emphasis on possible residual pore-fluid stresses. Chap. 3 examines the problem of craters formed by explosions close to the sloped surface of a semi-infinite medium. Chap. 4 deals with cratering phenomena caused by multiple charges, where coalescence of cavities may occur following detonation.—*from* Authors' introduction

06771 **Vineyard, Jerry D.** Preliminary report on the geology of some large springs in the Missouri Ozarks [abs.]: Caves and Karst, v. 9, no. 6, p. 51, 1967.

01096 **Wade, E. J.** The Tasu mine—A brief history and general description: Canadian Mining and Metall. Bull., v. 61, no. 671, p. 339–342, 1968.

The Tasu magnetite-chalcopyrite deposit, on Queen Charlotte Islands, B.C., is a contact metasomatic deposit associated with skarn of garnet-pyroxene-epidote. Skarn replaces limestone, limy tuffs, and feldspar porphyry and andesite. Iron was distilled from the iron-rich Karmutsen series by heat from a diorite batholith and its associated feldspar porphyry intrusions.—ARK

Wahlberg, James S. *See* Mountjoy, Wayne. 00777

00828 **Walker, A. D.** *Protosuchus, Proterochampsa*, and the origin of phytosaurs and crocodiles: Geol. Mag., v. 105, no. 1, p. 1–14, illus., 1968.

Studies of the casts of *Stegomosuchus*, a small reptile from the Upper Trias of the Connecticut Valley, hitherto regarded as a pseudosuchian thecodont, suggests that the skull of *Protosuchus* includes two pairs of supraorbital bones, and as a consequence the narrow interorbital region indicates a closer relationship to the

South African genus *Notochampsa* than has previously been thought. These three genera of Late Triassic crocodilians are placed in the family Stegomosuchidae von Huene, 1922. *Proterochampsa*, from the Ischigualasto Formation of Argentina, described by Reig (1959) and Sill (1967) as an ancestral crocodile, is considered to be an extremely primitive phytosaur.—Author's abstract

00772 **Walker, George W.; Swanson, Donald A.** Laminar flowage in a Pliocene soda rhyolite ash-flow tuff, Lake and Harney Counties, Oregon, *in* Geological Survey research 1968, Chap. B: U.S. Geol. Survey Prof. Paper 600-B, p. B37-B47, illus., table, 1968.

A simple cooling unit of texturally zoned soda rhyolitic ash-flow tuff has laminar flowage structures that formed during the end phase of movement after partial welding. The structures show that movement was southward from two vents at opposite ends of the Wagontire Mountain domal uplift. Ash-flow tuff is 2 to more than 40 m thick and has a total volume of less than 1 cu km. Several Pliocene ash-flow tuffs of comparable or vastly greater volume, but with compositions near calc-alkaline rhyolite and with less evidence of laminar flowage, occur in the same region. Eruption at a near-liquidus temperature onto depositional slopes steep enough to create unstable load conditions may have caused laminar flowage. Comparisons with other ash-flow tuffs showing laminar flowage suggest, however, that high sodium-potassium ratios and above-average total iron also are important in reducing glass viscosity sufficiently to permit mass laminar flowage.—*from* Authors' abstract

00898 **Walker, P. H.; Hall, G. F.; Protz, R.** Relation between landform parameters and soil properties: Soil Sci. Soc. America Proc., v. 32, no. 1, p. 101-104, illus., tables, 1968.

Landform parameters of slope gradient, slope length direction, curvature, distance from hillslope summit and elevation relative to summit were recorded with soil profile observations across small loess and drift landscapes in Iowa. Simple regression and correlation analyses were used to examine the relations between each soil property and parameters and also relations among parameters; geomorphic parameters were then fitted to soil data in different combinations in multiple regression. Generally, elevation and slope were most strongly related to soil properties. Slope length direction was also an important parameter for A horizon thickness and subsoil mottle features. When two sites were subdivided into convex and concave areas, significant regressions were again obtained. Considerable soil variation may result from the relict nature of some subsoil features, or in A horizons, from faunal activity.—*from* Authors' abstract

00902 **Walker, P. H.; Hall, G. F.; Protz, R.** Soil trends and variability across selected landscapes in Iowa: Soil Sci. Soc. America Proc., v. 32, no. 1, p. 97-101, illus., tables, 1968.

Soil profile features, measured in sample grids on small loess and drift landscape segments, were represented in polynomial trend equations. Summaries of analyses for selected polynomials are tabulated. The usefulness of fitting polynomials to soil-landscape data can be assessed in relation to Ruhe's soil-landscape model, generally applicable in Iowa. The polynomials not only provide a statistical fit of the data, but algebraic signs of coefficients provide a criterion of maxima or minima. The mantle of soil is described as a continuum in which variations can be represented as soil trends.—ESL

00836 **Wallace, Stewart R.; MacKenzie, W. Bruce; Blair, Robert G.** Preliminary report on the geology of the molybdenite deposits at Red Mountain, Daly mining district, Colorado [abs.]: Econ. Geology, v. 63, no. 1, p. 87-88, 1968.

01002 **Wang, Kung Teh.** Statistical study of suspension load of the Trinity River [abs.]: Houston Geol. Soc. Bull., v. 10, no. 9, p. 24, 1968.

00866 **Warren, John Stanley.** Dinoflagellates and acritarchs from the Upper Jurassic and Lower Cretaceous rocks on the west side of the Sacramento Valley, California [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 7, p. 2908B, 1968.

00905 **Wasson, John T.; Goldstein, Joseph I.** The north Chilean hexahedrites—Variations in composition and structure: Geochim. et Cosmochim. Acta, v. 32, no. 3, p. 329–339, illus., tables, 1968.

Determinations of Ni, Ga, Ge and Ir in 9 of the 12 hexahedrites from northern Chile shows that these irons have not resulted from a single shower. Structural evidence indicates that 5 falls are involved. The chief distinguishing property is their Ir content: 6 have Ir contents of about 4.0 ppm, while 3 others have contents of 65, 48, and 2.5 ppm. The two with the largest Ir contents also have unique Ni concentrations. The irons cannot be distinguished on the basis of their Ga and Ge contents. The structural groups, which are about the same as those based on Ir contents, are partly the result of reheating and severe shock. The study indicates that structural differences in single-crystal hexahedrites provide a sound basis for predicting variations in composition and origins in different falls.—KAS

00952 **Wasson, John T.** Concentrations of nickel, gallium, germanium, and iridium in Canyon Diablo and other Arizona octahedrites: Jour. Geophys. Research, v. 73, no. 10, p. 3207–3211, illus., tables, 1968.

A survey of Ni, Ga, Ge, and Ir contents of the disproportionately large number of coarse octahedrites discovered in Arizona shows that three falls are necessary to account for these objects. Two meteorites have unique compositions, whereas the remainder appear to be fragments of Canyon Diablo. A survey of 23 similar meteorites from other areas reveals that none of these objects has the same composition as Canyon Diablo. The ranges of Ga, Ge, and Ir concentrations among fragments from this single large meteoroid are about equal to the associated experimental errors for these elements of 4, 4, and 12 percent respectively. The Ni range, which is several times larger than the experimental error, may be related to the high proportion of inclusions in irons of this group. The scatter of Canyon Diablo specimens over distances as great as 360 m from the crater is believed to have resulted from human transport.—*from* Author's abstract

00990 **Watson, K. K.; Whisler, F. D.** System dependence of the water content-pressure head relationship: Soil Sci. Soc. America Proc., v. 32, no. 1, p. 121–123, illus., 1968.

The drainage to a water table of a saturated, stratified sand column in which a fine sand overlay a coarse sand evidenced a relationship between water content and pressure head for the coarse sand which was characteristically different from that obtained during the drainage of a uniform column of the coarse sand. The water content-pressure head relationship for each system is presented and the system dependence of the relationship discussed. The effect of this system dependence, and the limitation it places on the use of current analytical approaches in predicting pressure head and water content profiles during the drainage of layered soils, is then considered.—Authors' abstract

01134 **Watts, Murray.** Prospecting Copper Mine River area, N.W.T.: Mining in Canada, April, p. 24, 27–28, 1968.

Copper occurs in brecciated zones related to faulting in Precambrian basalt. Chalcocite and minor bornite are found within the breccia calcite matrix and as replacement selvages of wall rock. Mineralization is usually accompanied by carbonatization, chloritization, hematitization, and lesser albitization. Copper-bearing quartz calcite veins also occur and native copper and native silver have been found. Copper also occurs in shale and sandstone above and below the basalt. Basalt flows are cupriferous over a strike length of 70 miles.—ARK

06901 **Watts, W. A.** Late-glacial plant macrofossils from Minnesota, *in* Quaternary paleoecology—Internat. Assoc. Quaternary Research, 7th Cong., 1965, Proc., V. 7: New Haven, Conn., Yale Univ. Press, p. 89–97, illus., 1967.

Late-glacial plant macrofossils from seven sites in Minnesota are described and evaluated ecologically and chronologically; they are either rich in needles of *Picea* and *Larix*, or contain macrofossils of dwarf shrubs (*Dryas, Salix, Vaccinium*) and sedges (Cyperaceae), which indicate pioneer communities with affinities to the tundra

formation. In northeastern Minnesota, dwarf shrub communities were present until about 10,500 B.P., when the area was invaded by boreal forest. In southern Minnesota boreal forest was already present about 12,000 B.P., but at one site undated sediments containing a sedge flora underlie sediments rich in conifer needles. Probably the boreal forest invaded pioneer herbaceous vegetation in southern Minnesota before 12,000 B.P. but the boreal–forest tundra ecotone achieved stability in central Minnesota until 10,500 B.P., when it again moved north.—*from* Author's abstract

06909 **Wayne, William J.** Periglacial features and climatic gradient in Illinois, Indiana, and western Ohio, east-central United States, *in* Quaternary paleoecology—Internat. Assoc. Quaternary Research, 7th Cong., 1965, Proc., V. 7: New Haven, Conn., Yale Univ. Press, p. 393–414, illus., 1967.

Scattered records of ice-wedge casts, patterned ground, and involutions show that permafrost did exist around the margin of the Wisconsin ice sheet as far south as 40°. South of the glacial boundary, asymmetrical valley walls indicate solifluction occurred differentially on north- and east-facing walls from south- and west-facing walls. Spruce wood is present in Wisconsin till, yet no tundra plants occur in the till; therefore, only boreal forest, no tundra, occurred periglacially. Fossil mollusks in the till are quite different from present-day species, showing that the mean annual temperature within about 10 km of the ice margin was about –3°C. Snail distribution shows the 5°C isotherm to be about 200 km south of the ice margin during the maximum.—*from* Author's abstract

06849 **Weaver, J. D.** (compiler). Status of geological-research in the Caribbean, No. 13: Mayagüez, P. R., Univ. Puerto Rico Inst. Caribbean Sci., 26 p., 1967.

This mimeographed report contains lists of current projects in the different areas, arranged alphabetically by the geologist or organization doing the work. Areas covered, in addition to the general region, are Bahamas, Central America, Dominican Republic, Lesser Antilles, Puerto Rico and Virgin Islands, and South America.—ESL

06852 **Webster, David.** Stoddard County caves: Missouri Speleology, v. 9, no. 2, p. 14–18, illus., 1967.

Forked Cave and Bland Cave, the only caves in Stoddard County, were surveyed; they occur in the crescent-shaped band of Ordovician rock in the northwest corner of the County that forms a bluff along the old Mississippi channel, now a swamp.–ESL

Weir, J. E. *See* Rogers, C. L. 00825

Weitz, W. E., Jr. *See* Folsom, T. R. 01152

00839 **Wells, John D.; Stoiser, Lee R.; Erickson, Ralph L.** Geology and mineralogy of the Cortez gold prospect, Nevada [abs.]: Econ. Geology, v. 63, no. 1, p. 89, 1968.

Wendland, Wayne M. *See* Bryson, Reid A. 06832

Whisler, F. D. *See* Watson, K. K. 00990

00867 **Whisonant, Robert Clyde.** Stratigraphy and petrology of the basal Cambrian Chilhowee Group in central-eastern and southeastern Tennessee [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 7, p. 2909B, 1968.

06869 **White, Donald E.** Outline of thermal and mineral waters as related to origin of Mississippi Valley ore deposits, *in* Genesis of stratiform lead-zinc-barite-fluorite deposits (Mississippi Valley type deposits)—A symposium, New York, 1966: Econ. Geology Mon. 3, p. 379–381, 1967.

Studies of natural waters provide no support for a syngenetic origin for Mississippi Valley deposits in carbonate rocks, whereas a connate or fossil-water origin for

the dominant ore fluid for these deposits is supported by present evidence. Additional studies on minor constituents in fluid inclusions are needed. Possible mechanisms for achieving the indicated temperatures of 100° to 175°C in connate waters at sites of ore deposition are outlined.—VSN

06861 **White, H. Gene.** The petroleum industry in Alabama, 1964: Alabama Geol. Survey Circ. 45, 32 p., illus., tables, 1967.

Alabama's four oil fields produced about 8 1/2 million bbls oil in 1964, a decrease of about 680,000 from 1963; 89 percent came from the Citronelle field. The two small gas fields in Marion County yielded 14,580,000 cu feet of gas. Forty-six wells were drilled, of which 17 were completed as productive and 6 as dry development wells, and 23 as dry exploration holes.—MCM

06905 **Whitehead, Donald R.** Studies of full-glacial vegetation and climate in southeastern United States, *in* Quaternary paleoecology—Internat. Assoc. Quaternary Research, 7th Cong., 1965, Proc., V. 7: New Haven, Conn., Yale Univ. Press, p. 237–248, illus., tables, 1967.

Data from North Carolina and Virginia suggest a vegetational change. Full-glacial forests of North Carolina were dominated by pine and spruce, and a number of northern species also occurred; it was probably an open forest, or savannah. In Virginia, at the same time, the forests were dominated by spruce; pine and fir were subordinate. Data from the Carolina Bays support this also. New radiocarbon dates show the change to be at full-glacial time when rates of pollen accumulation were low. The water level in the Bays also changed, as postglacial and preclassical Wisconsin organic layers are below the present water level. The lakes were high during full-glacial, and the water was clear. The N zone dates from the Plum Point–Talbot interstadial complex.—*from* Author's abstract

00981 **Whitney, Bruce R.** The polka dot trilobite: Earth Sci., v. 21, no. 3, p. 110–111, illus., 1968.

In all the scientific literature written about trilobites, in only four instances, cited by R. C. Moore (1959), has their coloration been mentioned; since that treatise, there have been possibly one or two reports of coloration. A prone specimen of *Phacops rana*, recently acquired by the author from the Hamilton Formation, Middle Devonian, of Alden, N.Y., has a scattering of small jet-black spots on both sides of the axial furrow as well as on the free cheek of the trilobite.—GDC

Whittig, L. D. *See* Hendricks, D. M. 01072

Whittig, L. D. *See* Hendricks, D. M. 01073

01010 **Wickman, Frans E.** How to express time in geology: Am. Jour. Sci., v. 266, no. 4, p. 316–318, 1968.

It should be convenient to have a time expression for each power of 10 years in geology. The following terms, based on the SI and the historic time scale, are suggested (length of time in years–name): 1–(annus) year; 10–(decennium) decade; 10^2–(centennium) century; 10^3–millennium; 10^4–dekamillennium; 10^5 hectomillennium; 10^6–megennium; 10^7–dekamegennium; 10^8–hectomegennium; 10^9–gigennium. The use of such units could make discussion of geological events shorter and clearer. The megennium might be introduced as the standard time unit for pre–Pliocene geology; that is, ordinarily it would only be necessary to use figures, the time unit being implied by the subject.—Author's abstract

00829 **Wilcox, Margret Schnaitman.** An Upper Devonian flora from central New York State [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 7, p. 2743B, 1968.

01063 **Wilding, L. P.; Miller, Fred P.; Drees, L. R.** Acrylic plastic as a protective coating for easily hydratable and polar-liquid-treated clay minerals: Soil Sci., v. 105, no. 1, p. 2–7, illus., table, 1968.

It appears that the use of acrylic plastic as a protective agent for samples susceptible to rehydration after heat treatments is not satisfactory. On the other hand, acrylic plastic may be utilized effectively in reducing the dissipation of an organic polar compound from the clay surface.—JWH

Willden, Ronald. *See* Gibbs, J. F. 00793

Williams, Charles C. *See* Jungmann, William L. 00824

00881 **Wilson, James.** Calcareous nannofossils in the upper Eocene and lower Oligocene of Florida [abs.]: Georgia Acad. Sci. Bull., v. 26, no. 2, p. 73–74, 1968.

06793 **Wilson, Michael David.** The stratigraphy and origin of the Beaverhead Group in the Lima area, southwestern Montana [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 6, p. 2487B–2488B, 1967.

06794 **Wilson, Robert Lake.** Pennsylvanian stratigraphy of the northern part of Sand Mountain, Alabama, Georgia, and Tennessee [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 6, p. 2488B, 1967.

Wilson, William H. *See* Peselnick, Louis. 00971

06822 **Winter, Thomas C.** Linear sand and gravel deposits in the subsurface of Glacial Lake Agassiz, *in* Life, land and water—Conference on environmental studies of the Glacial Lake Agassiz region, 1966, Proc.: Manitoba Univ. Dept. Anthropology Occasional Paper 1, p. 141–154, illus., 1967.

Four linear sand and gravel bodies have been mapped in the subsurface of the Lake Agassiz region in Minnesota. One body is accumulated outwash in the form of a kame terrace, later covered by lake sediments. Two others are from glacial-ice-stream deposits carrying sand into the lake silts and clay. Another body, previously considered as a beach ridge from an earlier lake stage, could be interpreted as the alluvial type deposit already mentioned also, so that a pre-existing stage need not have existed. All of the bodies are potential ground-water sources.—HRC

Withers, D. W. *See* Geiger, K. W. 00821

06897 **Wobber, Frank J.** Put geology surveys in orbit to find oil: Oil and Gas Jour., v. 65, no. 50, p. 158–162, 1967.

The feasibility of using Gemini-type orbital photography for petroleum exploration and modern sedimentation studies is discussed. Broad aerial coverage for basin-wide structure studies, sequential coverage for sedimentation and environmental studies, elimination of national border restrictions, cartographic detail, and consistent scale and illumination are some of the advantages.—CLP

06795 **Wolff, Manfred Paul.** Deltaic sedimentation of the Middle Devonian Marcellus Formation in southeastern New York [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 6, p. 2488B–2489B, 1967.

01045 **Wolleben, J. A.; Pauken, R. J.; Dearien, J. A.** FORTRAN IV program for multivariate paleontologic analysis using an IBM System/360 Model 40 computer, *in* Computer programs for multivariate analysis in geology: Kansas Geol. Survey Computer Contr. 20, p. 1–12, tables, 1968.

In attempting to make comparisons between paleontologic sample sets based on large numbers of variables, if the variables can be quantified, then the computer program described can be used. It computes mean vectors and sum of squares and cross-products matrices for 20 sample sets, using up to 15 variables, and having up to 99 samples in each set. About 2 1/4 min are required for compilation and execution of an analysis of 17 sample sets with 13 variables and 20 samples per set.—ESL

Wollenberg, H. A. *See* Gibson, W. M. 01125

06782 **Wones, David R.** Compositional variations and phase equilibria of some layer silicates, *in* Layer silicates—A.G.I. short course lecture notes, New Orleans, La., Nov. 17–19, 1967: Washington, D.C., Am. Geol. Inst., p. DRW1–DRW142, illus., tables, 1967.

Chemical variations follow definite patterns which are due to substitutions in the oxide–hydroxide and silicate sheets. They are primarily due to charge and size effects, though crystal effects may occur in iron rich minerals and which also may control trace-element substitutions. The characteristic properties of individual sheets are reviewed, exemplified in silicates and hydroxides, and comparisons are made of these characteristics with the derivative layer silicates. The phase equilibria of certain mineral groups is described. Considerable space is allotted to the micas.—HRC

01112 **Wood, Gordon H., Jr.; Trexler, J. Peter; Yelenosky, Andy.** Geologic map of the Minersville quadrangle, Schuylkill County, Pennsylvania: U.S. Geol. Survey Geol. Quad. Map GQ-690, scale 1:24,000, sections, 1968.

00820 **Wood, P. R.; Burton, L. C.** Ground-water resources in Cleveland and Oklahoma Counties: Oklahoma Geol. Survey Circ. 71, 75 p., illus., tables, geol. map, 1968.

Permian formations are exposed at the surface, and Quaternary terraces occur at one or more levels along the valleys. These terraces and alluvium supply water for domestic and stock use at many places, but the Garber Sandstone and Wellington Formation are the principal sources for municipal and industrial purposes. At depths varying from 100 to 1,000 feet below land surface, the water is too highly mineraized for most use. Yields range from 50–450 gpm. In most of the area, water levels have changed little, but have declined substantially in the Norman and Midwest City areas. The two formations are estimated to contain 50 million acre-feet of fresh water.—*from* Authors' abstract

06784 **Wornardt, Walter William, Jr.** Stratigraphic distribution of diatom floras from the "Mio-Pliocene" of California [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 6, p. 2551B, 1967.

Wright, H. E., Jr. *See* Cushing, E. J. 06924

Wright, Herbert E., Jr. *See* Matsch, Charles L. 06821

Wright, T. L. *See* Shaw, H. R. 01039

00980 **Wright, Thomas L.; Kinoshita, Willie T.; Peck, Dallas L.** March 1965 eruption of Kilauea volcano and the formation of Makaopuhi lava lake: Jour. Geophys. Research, v. 73, no. 10, p. 3181–3205, illus., tables, 1968.

From March 5 to 15, 1965, Kilauea volcano erupted over 15 million cu m of tholeiitic basalt along the upper east rift zone between Makaopuhi and Kalalua craters. A pond of basalt 83 m deep was left in the west pit of Makaopuhi crater. The eruption was preceded by inflation of the Kilauea summit and was accompanied by collapse of the summit. Seismic activity was exceptionally low in the months preceding the eruption and during the eruption. Amplitude of harmonic tremor correlates with the rate of fountaining during the eruption. Temperatures of the erupted lavas have been estimated at 1190°–1200°C. The erupted lavas were olivine-poor tholeiitic basalts. Lavas erupted at successively later times down rift are shown to be differentiated from lavas erupted at Makaopuhi crater by removal of olivine, clinopyroxene, and minor plagioclase during transport in the rift zone.—*from* Authors' abstract

00787 **Wrucke, Chester T.; Sheridan, Douglas M.** Precambrian rocks penerated by the deep disposal well at the Rocky Mountain Arsenal, Adams County, Colorado, *in* Geological Survey research 1968, Chap. B: U.S. Geol. Survey Prof. Paper 600-B, p. B52–B59, illus., table, 1968.

The disposal well at Rocky Mountain Arsenal, northeast of Denver, penetrates Precambrian rocks between a depth of 11,935 feet and the hole bottom at 12,045

feet. Migmatitic hornblendic biotite-quartz-feldspar gneiss of the lower 75 feet of this section is similar in composition and fabric to metasedimentary gneisses in high-grade metamorphic terrane of the nearby Front Range. A weathered zone of illitic altered gneiss, in the upper 35 feet of the Precambrian section, is overlain by the Fountain Formation of Pennsylvanian and Permian age. Fractures, thin veins, and zones of microbreccia that cut the Precambrian gneiss cored in the well resemble structures along breccia reefs exposed in the mountains west of Denver. This similarity suggests that a fault or fracture zone may occur in the general vicinity of the arsenal well.—*from* Authors' abstract

00838 **Wrucke, Chester T.; Armbrustmacher, Theodore J.** Geochemical anomalies near Gold Acres and Tenabo, Lander County, north central Nevada [abs.]: Econ. Geology, v. 63, no. 1, p. 88, 1968.

0682

00966 **Wu, Francis T.** Parkfield earthquake of June 28, 1966—Magnitude and source mechanism: Seismol. Soc. America Bull., v. 58, no. 2, p. 689–709, illus., tables, 1968.

The Parkfield earthquake of June 28, 1966 (04:26:12.4 GMT) is studied using short-period and long-period teleseismic records. It is found that (1) M_b = 5.8 and M_s = 6.4 as compared to M_b = 5.4 and M_s = 5.4 for the foreshock (04:08:54); (2) both the Rayleigh and Love wave radiation patterns conform to those of a double couple at a depth of about 8.6 km; (3) the main shock can be represented by a series of shocks separated in space and time. The near-field strong-motion data support the last conclusion. Based on strong-motion seismograms, and the surficial evidences of the dimensions of the fault, the energy is found to be 10^{21} ergs. Author's abstract

00986 **Wyder, J. E.** Surface resistivity surveys in southeastern Manitoba: Canada Geol. Survey Paper 67-44, 59 p., illus., tables, 1968.

Reconnaissance surface electrical resistivity surveys were conducted in seven areas in southeastern Manitoba. The results show that if certain precautions are taken, the surface resistivity method can be a useful tool for locating and delineating sand and gravel deposits. The results obtained in the Winkler area are a particularly good example of the value of the use of resistivity surveys in the search for gravel and ground water resources.—Author's abstract

00876 **Yang, Tsu-Hsi.** Oscillatory flow in a porous medium [abs.]: Dissert. Abs., Sec. B, Sci. and Eng., v. 28, no. 7, p. 2884B, 1968.

01003 **Yarborough, Hunter.** Geologic history of the Gulf Basin [abs.]: Houston Geol. Soc. Bull., v. 10, no. 9, p. 22, 1968.

Yelenosky, Andy. *See* Wood, Gordon H., Jr. 01112

01146 **Yochelson, Ellis L.** On the nature of *Polylopia*: U.S. Geol. Survey Prof. Paper 593-F, p. F1-F7, illus., 1968.

The rare Middle Ordovician fossil *Polylopia billingsi* (Safford) is redescribed. Its shell is interpreted as a simple, elongate, narrow closed cone; previous descriptions were based on multiple shells nested by currents after death of the animal. New occurrences in eastern Tennessee and Minnesota extend the stratigraphic range to Porterfield and Wilderness Stages. The animal is believed to have been benthonic, with the apex of the shell containing some gas which removed it from contact with the substrate. *Polylopia* belongs within the phylum Mollusca. It is not the sole representative of an extinct class of mollusks, and probably should be placed within the Hyolitha.—ELY

01136 **Young, David M.** Oil and gas development in Virginia during 1967: Virginia Minerals, v. 14, no. 2, p. 13–14, table, 1968.

A total of 3,827,447 Mcf of gas was produced in Buchanan, Dickenson, and Tazewell Counties, Va., compared to 4,249,340 Mcf for the previous year. Oil production in Lee County amounted to 3,491 bbl, from the Rose Hill and Ben Hur fields.

Drilling in the Ben Hur field encountered gas in the Trenton limestone at a depth of 2,235 feet and produced about 519 bbl oil; deeper drilling had no significant results, and only one out of five other wells had a show of oil at 2,481 feet. Well over half of the gas was produced in Tazewell County; a new well completed encountered gas in the Berea sandstone between 5,320 and 5,364 feet, with an initial flow of 200 Mcf.—GDC

Young, Keith K. *See* Daniels, R. B. 00923

Zangerl, Rainer. *See* Gaffney, Eugene S. 01145

06820 **Zoltai, Stephen C.** Eastern outlets of Lake Agassiz, *in* Life, land and water—Conference on environmental studies of the Glacial Lake Agassiz region, 1966, Proc.: Manitoba Univ. Dept. Anthropology Occasional Paper 1, p. 107–120, illus., tables, 1967.

In Ontario, no outlets have been found which drained the Lake Agassiz when the level was at the Campbell level or above; two advances and retreats may have opened and then closed outlets, but no evidence remains. The early outlets were closed by the Valders readvance and by the ice readvance to the Lac Seul moraine. The early outlets may have lowered the level by as much as 380 and 160 feet, but complete drainage could not have taken place. Three outlets occur in later stages: the Kaiashk, Pillar, and possibly indirectly through the Pikitigushi outlet. Lake levels controlled by the Pillar outlet may have been preceded by a lower water stage, followed by a rise to this outlet as the ice readvanced to the Nipigon moraine.—*from* Author's conclusions

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